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ABSTRACT

This bimonthly bulletin reports annotations of current literature on science and public policy. Coverage includes both "policy for science" and "science for policy" in the areas of engineering, technical and narrowly specialized publications. Its purpose is to aid persons who study, formulate, or implement public policy related to science by alerting them to new additions to the science policy literature. Documents are listed under the headings of (1) General, (2) Science, Domestic Problems and National Goals, (3) Needs and Allocation of Resources for Science, (4) National R & D Programs, (5) Science, Education, and the University, (6) Science Management and Policy-Making Bodies, (7) Science, Foreign Affairs, and National Defense, and (8) Science Policy in Foreign Countries. The 109 documents are listed under one of these categories. Cross-indexing is not used. Major meetings and other events in the area are also reported. (RR)

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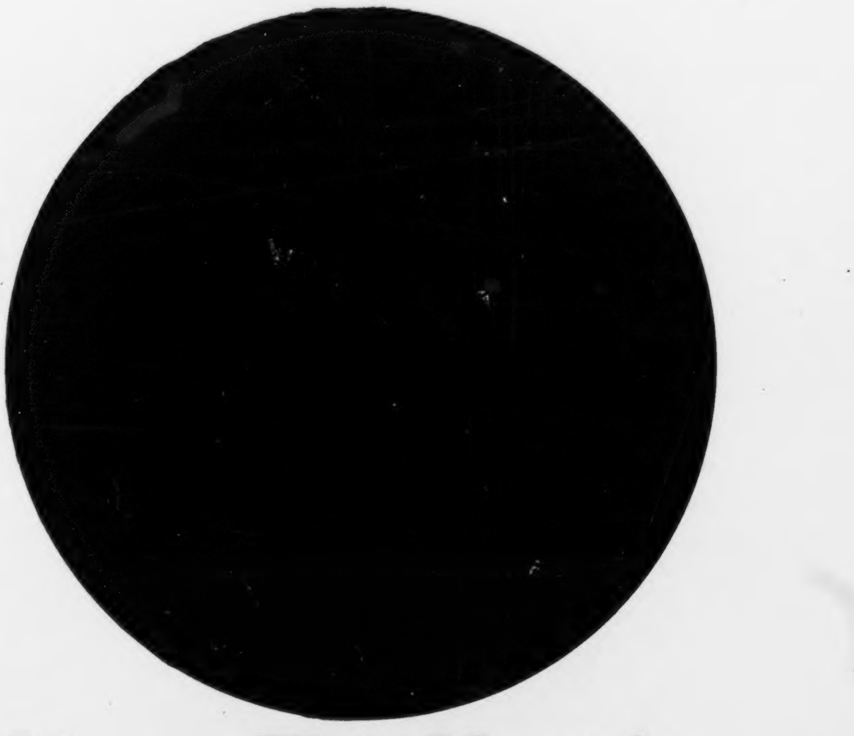

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Science Policy Bulletin

Battelle Memorial Institute

SCIENCE POLICY BULLETIN

The Bulletin, published bimonthly, reports the current literature in the area of science and public policy. The coverage encompasses both "policy for science" and "science for policy" matters. For brevity, "science" is used to denote engineering, technology, and science.

The Bulletin is intended for individuals engaged in studying, formulating, or implementing public policy relating to science and its use. The purpose of the Bulletin is to aid such individuals by alerting them to new additions to the science policy literature.

The information presented in the Bulletin consists principally of a bibliographic listing of current publications in the area. In addition, major meetings and other events in the subject area are reported.

The bibliography, although covering a broad topical scope, is selective in that publications of a highly technical and narrowly specialized nature are excluded.

The bibliographic information is presented under a number of topical categories. Each cited publication is recorded under a single category; cross indexing is not used. The numbering of publications under each category runs consecutively through all issues of the Bulletin, so that a given number refers to only one citation.

Copies of the listed publications are not available through Battelle but can normally be obtained from the originating agency.

The contribution of information to the Bulletin as well as suggestions and comments on its content, coverage, and format are solicited. All correspondence should be addressed to:

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SCIENCE POLICY TASK FORCE

President Nixon announced in October the formation of a task force to "review the Federal Government's present science policy and make recommendations as to its future scope and direction". The brief news release announcing the task force identified it as "another in the present series of task forces that are being established to assist the Administration with ideas and recommendations for 1970 and beyond".

Chairman of the science policy task force is Ruben F. Mettler, Executive Vice President of TRW, Inc. Other members of the task force are:

Warren G. Bennis
State University of New York
at Buffalo

Elmer W. Engstrom
RCA Corporation

Solomon Fabricant
New York University

Robert J. Glaser
Stanford University School
of Medicine

Philip Handler
National Academy of
Sciences

Theodore L. Cairns
E.I. du Pont de Nemours &
Co.

Oscar Ruebhausen
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& Gates

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Chauncey Starr
University of California

H. Guyford Stever
Carnegie-Mellon University

Charles H. Townes
University of California

Alvin M. Weinberg
Oak Ridge National
Laboratory

BIBLIOGRAPHY

I GENERAL

54. Daddario, E. Q., "Needs for a National Policy", Physics Today, v. 22, no. 10, October 1969, pp. 33-38.

> Issues and problems of public policy for academic science are reviewed and discussed by the chairman of the House Subcommittee on Science, Research and Development. Daddario examines these questions: (1) "Are mission agencies abdicating their responsibility for academic research?"; (2) "How shall the nation sustain its institutions of higher education in science and technology?"; (3) "How should multidisciplinary research on the problems of society be fostered?"; (4) "How can Congress obtain an improved input of information and ideas from the scientific community?". With respect to (1), Daddario accuses federal agencies of "dumping...well established, productive research groups onto NSF". "This dumping can not go on. My subcommittee has no intention of permitting NSF to become a relief agency for now unwanted research". It is a "matter of immediate priority...to re-establish agency responsibility for support of academic research and thus to sustain our pluralistic system". As for (2), the author states that some universities "are risking their financial health to give us time to shape and apply... a policy", but "we are not yet shaping and applying one". With respect to (3), Daddario discusses the need for multidisciplinary research, cites a few examples of the desired types of such research, and concludes that "Precious little" is being done. For (4), the author calls for inputs from the scientific community that "look beyond the needs of one particular specialty and compare the needs and opportunities of various fields of science".

55. "Lee DuBridge: An 'Old Pro' Is in Command", Scientific Research, v. 4, no. 18, 1 September 1969, pp. 11-12.

> Science policy in the Nixon Administration and views of the President's Science Advisor on sundry policy issues are presented. "If there's a Nixon-DuBridge science policy it is this: to revitalize federal support of basic research, on the one hand, and to point government-financed applied research toward the solution of the country's many social ills, on the other". "It is becoming more and more evident," DuBridge said in an interview, "that the distinction between the

sciences and technology is fading. Government agencies will have to adapt themselves to this new era". "The National Science Foundation already is being changed to move ahead into...interdisciplinary fields". "NSF is the major hope for stimulating work on major national problems". As for graduate science education, DuBridge "says there is no grand scheme in the works to shore" it up; "the problem is to educate the public and the Congress to the view that the progress of this nation...depends on having a broad base of scientific knowledge, of well-trained scientists, and of applied research". Other topics touched on include federal institutional support for university science ("As soon as we get more scientific support...we can start talking about adding on institutional assistance") and the use of the federal laboratory complex in "solving some of society's problems".

56. "DuBridge: No Dept. of Science", Industrial Research, v. 11, no. 10, October 1969, pp. 37-38.

The arguments presented by the Presidential Science Advisor, Lee DuBridge, against the establishment of a Federal Department of Science are summarized. "The advantage claimed for the Dept. of Science is that it places a scientist at the Cabinet table...there are two drawbacks. In the first place, Cabinet members are politically appointed and are replaced with each new Administration". "In the second place, science is not a departmental matter but should, and does, pervade the whole government. A Dept. of Science would tend to bring more and more scientific activities into its own purview, whereas the policy should be to spread them into the many agencies where science is basic to the agency mission". And finally, DuBridge points out that science is already represented "at the White House, and therefore at the Cabinet level" by the Science Advisor. With respect to the proposal for combining the National Science Foundation with other agencies to form a new agency, DuBridge believes this would lower the "stature of the Foundation and its Director" and would make the support of science and science education "subservient to the operating role" of the agency. "Applied science should be carried out by agencies whose function incorporates the mission while basic science should be supported by an independent agency. That, of course, is the system which we now have". "If this system were adequately supported by the Congress through its authorization and appropriation activities, it could be made more effective than it is now. It is not so much the structure of science that needs strengthening as our national commitment to it".

57. Piccard, P.J. (ed.), "Science and Policy Issues: Lectures in Government and Science", F.E. Peacock Publishers, Inc., Itasca, Illinois, 1969, 156 pp.

These lectures deal with several facets and issues of science and public policy; they were presented at the Florida State University during 1964-1965 but were updated for publication. The first lecture, by Piccard, attempts to define science in a way suitable for study by political scientists, discusses the problems and prospects of formulating a national science policy, and reviews a potpourri of policy issues. The second lecture, by Everett Mendelsohn, traces the emergence of applied science as the "third scientific revolution". James McCamy, in the next lecture, discusses some of the changes in the politics, administration, and theory of American government produced by the interaction of science and government. Sanford Lakoff's essay suggests the use of the "scientific society" paradigm, rather than the "industrial society", for study and analysis purposes, and discusses the impact of R&D on social structure, decision-making, and social ideology. The impact of federal funding on education and research is discussed by Werner Baum. In a related lecture, Philip Adelson discusses some of the negative and positive effects of federal support of research, and suggests several needed policy changes. In his tutorial lecture, Leland Haworth reviews a variety of topics including federal objectives for science, relationship of science and technology, federal organization for science, and policy issues specific to the National Science Foundation. The final lecture, by Don Price, digests "the work of the other lecturers and points out the nature and relevance of their views while drawing his own conclusions".

58. "Science for Mankind", Science Journal, v. 5A, no. 4, October 1969

The entirety of this issue of the Journal is devoted to the theme "Science for Mankind". Contents:

Technomania Is Passing: A.W. Benn
No longer will the big, glamorous scientific project be an end in itself. The Ministry of Technology's money for civil science will go only to 'useful' projects

Science and Society: S. Silver
The deepest problems are those of human behavior, both individually and in social systems. These problems cannot yet be solved by a major technological attack

Technology and Human Values: E.G. Mesthene
Human values originate in a society's choices. They therefore change as the options available to man change, and technology widens the range of options

Research for Peace: K.E. Boulding
Today's world appears to be functioning close to the boundary between stable and unstable peace. Much more information is needed to effect an improvement.

The Dilemma of Social Man: P. Leyhausen
No animal population can survive a continuous increase in numbers without disaster. More effective action must be taken to curb human reproduction

Evaluating the Biosphere: B. Commoner
Man's world in its entirety must be taken into full account in determining the overall impact of his technologies. This has not been done in the past.

The Human Environment: R. Dubos
People are powerfully influenced by their physical surroundings. Professor Dubos warns of the hidden dangers inherent in some of the more advanced cities.

Real Goals for Education: A.D.C. Peterson
The aims of a school education must change in parallel with a changing world. Continued concentration on traditional teaching can only slow this change

Read Goals for Medicine: H. Miller
The dramatic successes of modern medicine have tended to obscure the fact that the gravest problems remain the less glamorous but common chronic illnesses

Science and the City: L. Llewelyn-Davies and P. Cowan
Urban planners face many problems as they try to improve man's life in modern cities. How they succeed will depend on society as well as on science

Assessing the Priorities: C.H. Waddington
So great are the changes and problems facing society that - says Professor Waddington - "the issues must be kept from the hands of myopic officialdom"

59. "Role of Science and Scientists in National and World Affairs", *Pugwash Newsletter*, v. 7, no. 1, July 1969, pp. 4-15.

A report of the Fifth Pugwash Symposium (May 1969) on the above topic is presented. The report lists the symposium participants and the papers presented. The related discussions and recommendations are summarized in some detail under seven headings:

- Impact of Science and Technology on Society
- The Relationship Between Science and Politics
- Science and Society
- International Scientific Organizations

- National Scientific Organizations
- Inter-Disciplinary Research
- Responsibilities of World Scientific Community

(The Pugwash Newsletter can be obtained from Prof. J. Rotblat, 9 Great Russell Mansions, 60 Great Russell Street, London, W.C.1., England.)

60. Schooler, D., Jr., "Political Arenas and the Contributions of Physical and Behavioral Sciences and Technologies to Policymaking", Paper presented at the Annual Meeting of the American Political Science Association, 2-6 September 1969, 20 pp.

The thesis of this paper is that the "contributions of physical technologies, because they are generally perceived as 'distributive' by politically significant groups, will have more impact on and utilization in public policy than behavioral technologies, which are generally perceived as 'redistributive' and 'regulative' as well as 'distributive' in their impact or implications". Physical and behavioral technologies are analyzed as to the requirements they impose and the impact they have on the individual and on the political and social systems. The "impacts as perceived by significant political groups, it is argued, explains much of the use of some physical technologies and disuse of some behavioral technologies by policymakers and government". The author reviews several contributions of physical and behavioral technologies to policymaking to support his argument, and suggests means for behavioral technology to "overcome these obstacles and augment its contribution to policymaking".

61. "Proceedings of the Symposium on Science Policy and Biomedical Research", Science Policy Studies and Documents, no. 16, Unesco, 1969, 76 pp.

The publication comprises the proceedings of the symposium organized by the Council for International Organizations of Medical Sciences, which was held on 26-29 February 1968. The report outlines the origin and aims of the symposium, presents expositive papers and related discussion on the three topics of the symposium (institutional structure and organization of medical research, integration of biomedical research policy in the overall planning of science and technology, and problems of science policy and legislation arising from medical advances), and conclusions adopted. Annexes contain comments of the participants on the working papers submitted for their examination. The topical papers were presented by B. Rexed (Sweden), P. Handler (U.S.), and C. Chagas (Brazil). The annex papers include comments on the "Institutional Structure and Organization of Medical

Research" (H. Bloch)","National Planning for Medical Research" (P. Handler), "Medical Research - Whose Responsibility?" (H. Bloch), and "Advances in Medicine and the Integrity of the Human Being" (Hersch).

(The report can be obtained from the Unesco Publications Center, P.O. Box 433, New York, New York 10016 - Price $1.75.)

62. "Program on Science, Technology and Society", Cornell University, 10 August 1969, 8 pp.

"Cornell University has formed an interdisciplinary Program on Science, Technology, and Society which draws its students, faculty and research workers from all areas of the University including physical sciences, biological sciences, social sciences, engineering, humanities, business and public administration. The purpose of the Program is to stimulate teaching and research on the interaction of science and technology with contemporary society". The Director and Deputy Director of the program are F.A. Long and Raymond Bowers, respectively. Illustrative topics of interest in the program are cited: Science, Technology and National Defense; World Population and Food Resources; National Policy for the Development of Science; the Sociology of Science; and The Ecological Impact of Developing Technology. "In all of these areas we expect to put particular emphasis on analysis of future trends". The planned teaching and research activities within the program are described. As for the size of the program, a "reasonable expectation is that the budget for the first year will be about $75,000. This should rise in a few years to a steady state annual budget of about $200,000". Support for the program is expected to come from Cornell funds, private foundations, and agencies of the Federal and State governments.

(For further information, write to the Program on Science, Technology and Society, 632 Clark Hall, Cornell University, Ithaca, New York 14850.)

63. "Index to Literature on Science of Science", Research Survey & Planning Organization, CSIR, v. 5, no. 4, April 1969, 15 pp.

This bibliography on the "science of science" covers the recent Indian literature on the topic as published in some 30 journals. The bibliography of 219 items is divided into the following categories: General, Science Expenditure, Science and Education, Science and Management, Science and Manpower, Science and Planning, Science and Policy, Science and Foreign Collaboration, Science and Organization, Science and Politics, Science and Society, Science and Economic Development, and Science and Industry.

(The Index may be obtained from A. Rahman of the Research Survey & Planning Organization, CSIR, Rafi Marg, New Delhi-1.)

II SCIENCE, DOMESTIC PROBLEMS, AND NATIONAL GOALS

46. "Transferring Environmental Evaluation Functions to the Environmental Quality Council", Hearings before a Subcommittee of the Committee on Government Operations, House of Representatives, Ninety-First Congress, 9 July 1969, 56 pp.

    President Nixon established the Environmental Quality Council, and the Citizen's Advisory Committee on Environmental Quality, by Executive order in May 1969. The Council's membership includes President Nixon, the vice president, six department secretaries, and the President's science adviser, as executive secretary. A House bill (H.R. 11952) to which these hearings are directed, would give the Council statutory recognition, transfer to the Council a number of "environmental functions of various executive branch agencies", declare a national environmental policy, and require "an annual conservation and environmental report" from the Council. The hearings focused chiefly on the provisions of the bill and the views of the executive branch with respect to them, as presented by L. A. DuBridge. Also included in the hearings are H.R. 11952, Senator's Jackson bill to establish a Council on Environmental Quality, and the President's Executive order cited above.

47. "National Environmental Policy Act of 1969", 91st Congress, Senate, Report no. 91-296, Calendar no. 287, 9 July 1969, 48 pp.

    This report amends and describes Senate bill S. 1075 which presents a national environmental policy, authorizes federal agencies to carry out functions to implement the policy, and creates a Board of Environmental Quality Advisers. The report discusses the need for a comprehensive national policy, presents the legislative history of S. 1075, relates the bill to existing policies and institutions, and provides a section-by-section analysis of the proposed Act. Title I of the bill is a declaration of the Congress of a national policy. Title II authorizes the President to designate an agency or agencies to carry out a program of research and training grants and contracts, maintain an inventory of Federal activity in the area, and to establish an information system for ecological research materials; appropriations of $500,000 annually for FY '71 and '72 and $1 million for '73 and annually thereafter is authorized for this purpose. Also under this Title is the authorization for a Deputy Director of the Office of Science and Technology responsible for environmental management problems. Title III creates in the Executive Office of the President a

Board of Environmental Quality Advisers, "Composed of three members appointed by the President with the advise and consent of the Senate"; $1 million annually is authorized for salaries and operating expenses of the Board and its staff.

(This document can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.)

48. "Environmental Quality", Hearings before the Subcommittee on Fisheries and Wildlife Conservation of the Committee on Merchant Marine and Fisheries, House of Representatives, Ninety-First Congress, May-June 1969, Serial no. 91-6, 472 pp.

These hearings were held in connection with 11 House bills dealing with environmental quality. The bills calls for the establishment of a Council on Environmental Quality in the Executive Office of the President, and for an annual report from the President to Congress on the state and trends of the nation's environment. The Council is intended to serve as the "focal point for all new and authoritative data concerning...environmental quality. It would interpret these data, analyze their usefulness and importance, and inform the President of their impact on the national ecology as a whole. Based on its findings, the Council would then make appropriate recommendations in its annual report to the President and...would assist the President in the preparation of his annual report to the Congress". The hearings include statements of some 75 witnesses and associated discussion.

(This document can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.)

49. "The Cost of Clean Air", First Report of the Secretary of Health, Education, and Welfare to the Congress of the United States in compliance with Public Law 90-148, The Air Quality Act of 1967, June 1969, 111 pp.

"This report provides estimates of the prospective costs of air pollution control efforts under the Air Quality Act...during Fiscal Years 1970-1974." Government expenditures for air pollution control programs are expected to grow at an annual rate of about 30 percent, starting from $159.6 million in 1970 and rising to $454.5 million in 1974. Estimates (high and low) of industrial spending for fuel combustion sources and selected industrial process sources in 85 metropolitan areas are also presented for the 1971-1974 period; tables showing costs for each of the various industrial categories of controlling sulfur oxides and particulate emissions from fuel combustion and process sources are presented. Estimates are also provided of the prospective costs to consumers for control of motor vehicle pollution.

(The report can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.)

50. "U.S. Reneges on $3-Billion for Environment, Advisory Committee Tells President", Air/Water Pollution Report, v. 7, no. 35, 1 September 1969, p. 288.

"The Federal Government has reneged on $3-billion in promises of funds to improve the environment, [according to the] President's new Citizens Advisory Committee on Environmental Quality. In its first report to the President, since its appointment as an adjunct to the Cabinet-level Council on Environmental Quality last Spring, the panel headed by Laurance S. Rockefeller of New York blamed the $3-billion disparity between Congressional authorization and appropriations over the last 5 years for the magnitude of present problems of air and water pollution, solid waste disposal, noise pollution, and general environmental deterioration. The 36-page report listed gaps between Congressional intentions and appropriations since 1965 of $2.588-billion in water pollution control grants to the states, $193.9-million for air pollution control, $193.7-million in highway beautification, $171.5-million in the Land and Water Conservation Fund, and nearly $50-million in solid waste management. "The justification for these programs still exists," the Citizens Advisory committee said, "and if anything the problems are more serious today than ever. What is needed is a review of Federal expenditures, the establishment of reasonable priorities, and the appropriation of sufficient funds to adequately implement the programs." The panel pointed out that even with the existing money shortage the Federal Government could use its licensing powers for environmental improvements: "The Atomic Energy Commission, the Corps of Engineers, the Federal Power Commission, and the Federal Aviation Administration, among others, all grant permits which substantially affect the environment. In recent years some attention has been paid to the environmental impact of what the licensee is allowed to do. But legislative and administrative authority is spotty and uneven".

51. Boffey, P.M., "The Environment: ACS Report Is Practical Anti-Pollution Guide", Science, v. 165, no. 3898, 12 September 1969, pp. 1104-1107.

The American Chemical Society (ACS) has issued a report entitled 'Cleaning Our Environment - The Chemical Basis for Action', which covers air and water pollution, solid waste disposal and pesticides. "It reviews the current state of the art of the science and technology of environmental improvement (what is known and how it is being used; what must be learned and how it might be used) and also makes 73 recommendations to accelerate the development and use of that science and technology". "The report is too wide-ranging to permit easy summarization, but several persistent themes emerge throughout the document": 1) "an appalling lack of knowledge is hampering pollution control efforts"; 2) "the pollution technology currently in use in this country is generally antiquated"; 3) "it is difficult to whip up enthusiasm for pollution control"; and 4) "environmental problems are rarely amenable to sweeping solutions; the benefits of even major breakthroughs in research are more likely than not to be limited to discrete subsystems of the overall system". "The central conclusion of the report is that technical know-how has advanced to the point where 'this country can take enormous strides, now, toward a cleaner environment' if it is willing to devote sufficient energy and financial support to the task". The remainder of the article discusses the genesis of the study, presents opinions expressed by scientists and industrialists concerning the report and briefly summarizes the report's analysis of the evidence that pollution is causing ill-effects and its recommendations for the four pollution areas covered.

(A summary of the report and its recommendations are presented in the 8 September 1969 issue of Chemical & Engineering News; the full report is available from Special Issues Sales, American Chemical Society, 1155 16th Street, N. W., Washington, D. C. 20036; $2.75.)

52. "Pollution-Research Centers Proposed", Scientific Research, v. 4, no. 18, 1 September 1969, p. 15.

The Argonne Universities Association (AUA), a consortium of 30 universities that runs Argonne National Laboratory, proposed to "conduct pollution research on the basis of cooperation between a national lab., industry, and a group of universities". "The plan, to be submitted to the Office of Science & Technology, consists of establishing three or four regional pollution-research centers aroung the U.S., to be run by organizations like the AUA. The centers would coordinate work at existing labs. They would also involve themselves in the social, legal, and engineering aspects of pollution. It is not clear, however, whether they would conduct research of their own. The details of how the regional centers would be run and how the government might pay for them will be worked out by a 6- to 8-man committee soon to be appointed. Over the next few months, the committee will inventory the facilities of Argonne National Lab and of the 30 AUA member universities, and determine the degree of university interest in collaborating with scientists in national labs and in industry".

53. "Expanded Solid Waste R&D Urged by White House Panel", Washington Science Trends, v. XXII, no. 26, 6 October 1969, pp. 151-152.

A White House advisory panel has called for a broadly expanded research, development and demonstration program to cope with solid waste problems. The panel, in its report to the Office of Science and Technology, states that "the control program now underway with Federal support 'is insufficient in relation to the total solid waste needs' and should be expanded to take advantage of technological advances". "U.S. agencies funded $15.4 million in solid waste R&D in Fiscal 1968 - compared with nearly $300 million on water pollution control. The disparity is apparently the result of belated recognition of solid wastes as 'a costly and pressing national problem than can seriously menace health and welfare'". Major recommendations of the panel include (1) an expanded federal program aimed at cost reduction, recycling of solid wastes for reuse, and protection of the environment, (2) establishment of educational programs at universities in solid waste management, and (3) training programs for public officials and employees, and information services to the general public.

(The report, Solid Waste Management, A Comprehensive Assessment of Solid Waste Problems, Practices and Needs, can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402 - Price: $1.25.)

54. DuBridge, L.A., "Federal-State Collaboration in Science and Technology", Address at the National Governor's Conference, Colorado Springs, Colorado, 3 September 1969, 12 pp.

In this address, the President's science adviser reviews some examples of Federal-State collaboration in science and technology, suggests that state governments develop scientific and engineering advisory groups, and calls for a collaborative effort in air and water pollution control. In connection with the latter, DuBridge notes the recent establishment of the President's Environmental Quality Council and discusses the problems and prospects for dealing with both air and water pollution. He recommends "that the governor of every state... establish close to his office some type of Environmental Quality Council. This could be a Council of top level department heads concerned with environmental matters and it should also include a top level advisory commission of first class experts on environmental problems. At the Federal level we would like to maintain contact with such...bodies...in order to exchange information and ideas, to develop collaborative mechanisms, to coordinate regulatory functions and jointly to investigate and solve the fiscal problems which are involved".

55. "Long-Range Research Programs", Science News, v. 96, no. 12, 20 September 1969, p. 238.

> "At the request of the Department of Housing and Urban Development, two committees of the National Research Council last week published reports indicating a need for more long-range programs of research and development to investigate the needs of the people and to solve the problems of the nation's cities. One study concerned itself with social and economic aspects, the other with technological and cost-reducing techniques. According to the results, short-term projects must be developed, but emphasis must be on projects that will yield contributions over the long term. The committees call for:
>
> - Studies on population growth and change, economic and social characteristics, redistribution and demographic aspects.
> - More efforts to study the operation of existing legal programs.
> - Development of more effective information systems.
> - Development of more appropriate measures for evaluating the improvement of the quality of urban life.
>
> The Committee on Social and Behavioral Urban Research was headed by Dr. Raymond A. Bauer of Harvard University. Dr. James F. Young of the General Electric Co. was chairman of the Committee on Urban Technology."

56. "Both Academies to Advise HUD on Program to Lower Costs of Mass Housing", News Report, National Academy of Sciences-National Research Council-National Academy of Engineering, v. 19, no. 7, August-September 1969, p. 1.

> "A joint committee has been formed by the National Academy of Sciences and the National Academy of Engineering to advise the U.S. Department of Housing and Urban Development on scientific and technical aspects of 'Operation Breakthrough' and to encourage broad industrial and professional participation in the program. 'Operation Breakthrough' is HUD's program to develop low-cost, mass-produced housing. Bids are to be opened...for the construction of 100 experimental units of varying types on eight sites around the country. A prime task of the advisory committee will be to assist HUD in establishing the adequacy and acceptability of new systems, materials, and techniques that are not recognized by building regulations and safety codes. The committee will also advise on the pilot programs to be conducted and will recommend needed research."

57. "State Technical Services Future Undecided", Washington Science Trends, v. XXII, no. 24, 22 September 1969, p. 141.

> The Commerce Department is still awaiting a Nixon Administration decision on the future of the State Technical Services program, which is designed to bring technology to local business and

industry. "Appropriations for the 50-state program have been held up pending a re-evaluation of the program by the Administration, and by Arthur D. Little, Inc. Officials declined to disclose the contents of the Little report, which reportedly asserted, on the basis of 'a few cases' that 'the overall cost of the program is commensurate with the significant economic benefits generated.' The study, which is still in a draft form, reportedly concludes that public support of the program is justified" on several grounds: "Revenue returns from the benefits largely pay for the costs of the program"; "There are substantial secondary benefits, both economic and sociological"; "The motivation of industry to innovate is an important public function"; "The program leads to an upgrading of the technological competence of industry"; "Higher-grade technical manpower can be attracted to an industry which uses technological advances"; "Successful operation of the program has implications for technology transfer as an aim of foreign policy (i.e., increase exports and decrease imports.)."

III NEEDS AND ALLOCATION OF RESOURCES FOR SCIENCE

40. Lecht, L.A., "Manpower Needs for National Goals in the 1970's", F.A. Praeger, 1969, 183 pp. ($7.50).

> This book analyzes and estimates the manpower required by 1975 for achieving "an illustrative set of national goals designed to provide over-all improvement in the pattern of American life". The implications for manpower needs are also examined for competing national priorities, and the consequent requirements for education and job training are discussed. Overall, the study concludes that the achievement of the illustrative national goals will require a "labor force of man than 100 million - some 10 million more than are expected" to be available in 1975 - and that the "kinds of jobs the economy will need...will be significantly influenced by the nation's choice of priorities". As for R&D, which is treated as a national goal, expenditures are expected to rise to $40 million by 1975, and the overall manpower requirements to reach 4.3 million. Of the total manpower required for the R&D goal, about 1.3 million represent scientists, engineers, and technicians.

41. "Scientific Activities of Nonprofit Institutions 1966", Surveys of Science Resources Series, National Science Foundation, NSF 69-16, March 1969, 82 pp.

> "This report summarizes the results of the National Science Foundation's survey of scientific activities of independent nonprofit organizations in 1966". (It is comparable in scope to the earlier NSF survey of nonprofit organization covering the year 1964). The report includes data on the financial and manpower resources used by such organizations, as well as the areas of science and engineering to which the resources are directed. The types of organizations covered in the survey include research institutes, federally funded R&D centers (administered by nonprofit institutions), societies and academies of science, private philanthropic foundations, and science exhibitors. Among the highlights of the findings are the following: the full-time-equivalent number of R&D scientists and engineers employed by nonprofit organizations totaled 24,300, compared with 5,300 in 1964; R&D expenditures amounted to $800 million in 1966; 68 percent ($540 million) of this was federal expenditures for R&D contracted to nonprofit institutions.
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> (This report can be obtained from the U.S. Government Printing Office, Washington, D. C. 20402 - Price $1.00.)

42. "State Governments Employ 200,000 Scientific, Professional and Technical Personnel", U.S. Department of Labor, Office of Information, Washington, D. C., 8 April 1969, 2 pp.

> Some of the findings of a recent survey made by the Labor Department's Bureau of Labor Statistics in cooperation with the National Science Foundation are cited. "The survey covered

all State government agencies except educational agencies, schools and colleges". "State government agencies employed about 200,000 scientific, professional and technical personnel in 1967. The number of State-employed scientists increased 23 percent over 1964, when the last count was made". "Health professions - physicians, psychiatrists, sanitarians, veterinarians, dentist, nurses - grew by almost 13 percent between 1964 and 1967. Technicians increased slightly, while engineers showed virtually no change. Most of the scientists were employed in agencies dealing with agriculture and conservation, and most of the engineers were in the highway and public work departments". Tabular data are presented which indicate the employing agencies, occupation and total number of people in each occupation by agency. "Health and welfare professionals accounted for most of the employment gain. Health professionals alone increased by 4,800 over 1964 - almost as many as the combined increase for scientists, engineers, and technicians. Physicians, dentists, and nurses made up over three-fourths of these professionals, and nurses alone (25,300) accounted for almost two-thirds of the total. Social workers represented the single largest category of professionals (42,800) in the 1967 survey. Family services was the most important area of specialization for social workers, followed by child welfare and parole and probation".

43. "National Science Research Data Processing and Information Retrieval System", Hearings before the General Subcommittee on Education of the Committee on Education and Labor, House of Representatives, Ninety-First Congress, April 1969, 405 pp.

These hearings on H.R. 8809 are directed to a proposed amendment of the National Defense Education Act of 1958, which would establish a national storage and retrieval system for scientific information. The proposed nationwide system would include "all existing science research data processing and information retrieval facilities in the United States...including Government agencies, private and public universities,...laboratories and libraries, abstracting societies, professional organizations dealing with specific scientific disciplines and any other facilities dealing with dissemination of scientific research information". The system would "make such information readily available to any scientist or researcher...through an appropriate communications network". The hearings include statements by G. T. Seaborg (AEC), B. W. Adkinson (NSF), L. F. Carter (System Development Corp.), J. C. R. Licklider (MIT), and E. R. Piore (IBM), as well as several papers and reports on information systems.

(The document can be obtained for the U.S. Government Printing Office, Washington, D. C.)

44. "Information Goal: Wider Spread", Scientific Research, v. 4, no. 19, 15 September, 1969, p. 19.

> "A report that could have far-reaching effects on the federal government's information retrieval systems is expected soon from a task group within COSATI, the government's Committee on Scientific & Technical Information. Among other things, the group is expected to recommend that the government's Clearinghouse for Scientific Information make more noise about itself and its services. The Clearinghouse is not well enough known to its potential users in industry and academic science, ... nor is it getting all the information from government agencies that it should be getting for dissemination outside the government. The task group has also recommended that government procedures on information withholding be simplified so that more information generated by government R&D will be made public instead of being snagged on classification, copyright, or proprietary-right holdups." "The group's report will go to the Office of Science & Technology and to Presidential Science Adviser Lee DuBridge."

45. "Independent Research Faces Senate Hearings", Aviation Week & Space Technology, v. 91, no. 15, 13 October 1969, p. 22.

> Senate hearings will begin this fall on a bill to prohibit payment for independent research and development work not specifically part of a government contract. The bill was introduced...by Sen. William Proxmire (D.-Wis.). A Senate Armed Services subcommittee headed by Sen. Thomas J. McIntyre (D.-N.H.) will conduct the hearings, at which major background information is expected to be supplied by the General Accounting Office. Under terms of an agreement between Armed Services Committee Chairman John C. Stennis (D.-Miss.) and Sens. Proxmire and McIntyre, Sen. Proxmire last month withdrew an amendment to the Fiscal 1970 defense procurement authorization bill which would have imposed the research restrictions. He substituted a much milder amendment which merely restricted such payments for Fiscal 1970 to $468 million...after being assured by Sens. Stennis and McIntyre that prompt and full hearings would be held on his original amendment if he were to submit it later as separate legislation." "Industry spokesmen have told the House Armed Services Committee that in their opinion the amendment, as passed by the Senate, is unenforceable. The House committee declined to adopt it in reporting its version of the bill, and there was no floor action to add such an amendment. Both the Defense Dept. and the GAO have taken the position in recent weeks that they are waiting for each other to issue a report on the independent research situation before making their respective positions known. It is possible that GAO will not issue a report as such, but will present its findings on independent research as testimony at the McIntyre hearings."

46. "NSF Announces Plans for 1970 Expenditure Limits", Physics Today, v. 22, no. 10, October 1969, p. 67.

> "The National Science Foundation is imposing institutional expenditure limitations for fiscal year 1970; it is assuming that its own expenditure limitation will be about $495 million. Institutions (136 of them) whose expenditures for FY 1970 are estimated to be greater than $500,000 would be subjected to the limitation. NSF will not impose limitations on major construction projects; reductions in these activities were accomplished by limiting amounts and numbers of new awards. Also exempt from expenditure limitations are fellowships, traineeships, travel awards and summer education programs."

47. "Budget Cuts May Squeeze U.S. IBP", Scientific Research, v. 4, no. 20, 29 September, 1969, p. 14.

> "U.S. participation in the International Biological Program (IBP), already inadequate, may be further jeopardized if the House's $80-million cut in the National Science Foundation's $500-million budget for fiscal 1970 stands. The Senate has not yet acted, but the outlook is for a restoration of only part of the House cut. The result would be an NSF budget of approximately $420-$440 million, which would dash the hopes of U.S. IBP planners. The IBP is a five-year program that got under way in 1967. The U.S. submitted elaborate plans for its IBP research, but has failed to finance them". W. Frank Blair, chairman of the U.S. National Committee for the IBP, "originally requested $15 million as a line item in the NSF budget. That was cut to $5 million and he was told that other federal agencies would make up the difference. Funds coming from other agencies, however, would have to be used for research that is compatible with the donor agency's mission. Last year various IBP projects were funded by such diverse agencies as the Air Force Office of Scientific Research, the Atomic Energy Commission, and the Department of Health, Education & Welfare - but at low levels". "Major U.S. IBP research, if financed, will cover human ecology, including man's adaptability to his environment and how man affects his environment, and nutrition".

48. "IBP Grasslands Study Funded", Science, v. 165, no. 3900, 26 September 1969, p. 1338.

> "The National Science Foundation (NSF) has given the finance-troubled International Biological Program (IBP) a boost by awarding a $1.8 million grant - the largest to date - for an American grasslands ecological study. IBP officials estimate that 18 universities and about 100 scientific researchers will be involved in the grasslands project. George Van Dyne, professor of ecology at Colorado State University, has been named principal investigator. The IBP, which has suffered a series of setbacks and financial worries since its inception in 1964...

was organized to study ecological systems on a worldwide scale. The U.S. effort, overseen by a committee of the National Academy on Sciences, has relied principally on NSF for funding."

49. "Transportation Research is Cut", Industrial Research, v. 11, no. 4, October 1969, pp. 38, 40, 42.

The Nixon Administration cut all major R&D programs in the Department of Transportation (DOT) for 1970 except one. "Left untouched was $47.5 million for the Federal Aviation Administration, which represents 52% of the $91.4-million in revised R&D funds for DOT. About $14-million in DOT's R&D money will be used by the Federal Railroad Administration in its high-speed ground transportation project, off from $17-million submitted by the former Administration. The U.S. Coast Guard will be asking for $9.4-million, down from $15.4-million, primarily to test its national ocean data buoy development project. FAA will use its R&D money chiefly for air traffic control projects in the enroute and terminal areas... Projects in aircraft safety, navigation, aviation, medicine, and weather will take the rest of the proposed funds". "The $47.5-million sought by the agency compares with $61.5-million proposed by FAA for fiscal 1970 in its advanced planning report issued last spring". "FAA will employ $35.3-million of its total R&D funds for air traffic control programs, and $5.4-million is earmarked for aircraft safety, $4.5-million for navigation, $1.9-million for medicine, and $450,000 for weather". "The 1970 budget provides $20-million for the Office of the Secretary of Transportation for R&D in transportation planning". Other areas of transportation R&D to be pursued in 1970 are indicated and briefly discussed.

50. "HEW Has an Explanation", Chemical and Engineering News, v. 47, no. 40, 22 September 1969, pp. 16-17.

"HEW has quickly retreated from a planned 20% cutback in National Institutes of Health funding of medical research grants". Dr. Roger O. Egeberg, assistant secretary for health and scientific affairs, clarified an "erroneous impression" created by press reports that "medical research was being cut back by 20%". "Funding of continuing research projects... those for which NIH has a 'moral commitment' to continue funding would likely be cut by only 5%; funding for new projects and projects whose funding had expired and were being treated as new projects would likely be cut by only 10%". "NIH had temporarily withheld 20% of the funding for continuation grants up for renewal on Sept. 1, until the appropriations picture was 'somewhat clearer'. NIH felt it prudent..to withhold funding to avoid prejudicing future decisions. The change in grant funding...resulted from a just-received amended budget". The "Nixon Administration recommended $331.2 million for the continued grants for fiscal year 1970, about $3.5 million above fiscal 1969. For competing or new grants, the recommended budget for fiscal 1970 was $131.4 million, down about $12.8 million from 1969". "HEW did not sound retreat on another cutback. NIH had earlier warned directors of 19 of 93 clinical research centers, where new drugs and medical-treatment concepts are first tried on patients, that they might have to be closed by October 1970. Dr. Egeberg said it's almost certain the 19 centers will be closed". The "action taken is tentative because the whole funding picture will have to be reexamined after Congress approves the NIH appropriations bill".

51. Walsh, J., "NIH: Agency and Clients React to Retrenchment", Science, v. 165, no. 3900, 26 September 1969, pp. 1332-1333.

"The Vietnam war and accompanying inflation and competition for funds within the health budget have put heavy stress on NIH and created unprecedented strains between the agency and its clients". The source of difficulty for NIH and of confusion for outsiders is that while the Executive is concerned with actual expenditures, "the NIH works essentially with obligations - the money committed but not necessarily spent in a particular year". The budget stringencies and inflation have resulted in the decline of the number of research grants, "research resources and facilities," and small regional research centers, as well as a sharp cutback in manpower training. In university research, "the most serious adverse effects are being felt by younger researchers at the postdoctoral stage or seeking funds to establish themselves as independent investigators". The unlikeliness of a brighter budget picture suggests that "NIH management will have to make increasingly difficult decisions under mounting pressures". Although NIH administrators have generally enjoyed the confidence of their clients, the move from affluence to retrenchment has resulted in NIH beneficiaries asking for a greater voice in deciding how funds are to be distributed. "In this more competitive day, attention may well be shifting from the question of the quality of NIH's research to the quality of its policy decisions".

52. "Dismay Over Foundations", Science News, v. 96, 11 October 1969, p. 326.

A tax reform bill is now pending for tax-exempt foundations; it has been passed by the House and is now under examination by the Senate Finance Committee. "The reform act is unselective. It is equally harsh to all foundations. The proposed 7.5 percent tax on foundations' net income, it has been estimated, would reduce foundation support of research by $100 million per year. Added to reductions in Federal spending, such as the recently announced cuts in the Department of Health, Education and Welfare budget and the decreased research funds of the National Institutes of Health, a severe shortage of research funds is a likely consequence". Although "the public outcry against foundation abuses have produced the legislation which...could...inhibit foundations support of research", the scientists who depend on foundation support feel "the foundation is as important to research as the Government". Foundations "can afford to be more concerned with the long-range future and Government, of necessity, is more concerned with the present and short-range future".

53. "Post Office May Sell Bonds for R&D Monies", Industrial Research, v. 11, no. 4, October 1969, pp. 42-43.

R&D needs of the Post Office are briefly discussed in the context of pending legislation for revamping the department. Two bills, one from the House and the other from the Administration, are aimed at reorganizing the department "along more profit-and-loss conscious business lines". "Any attempt to make the Post Office...a self-sustaining body, postal authorities feel, would necessarily entail extensive additional research and application of new technologies". To meet this requirement, the House bill would establish a 'Postal Modernization Authority' "to raise funds, acquire and modernize facilities and equipment, and lease them to the department"; the Administration bill "would permit the Postal Service itself...to sell bonds to finance long-term improvements". "Such a finance plan would help alleviate the problem voiced by postal authorities over the years of not being able to compete for funds with the more glamorous demands of defense, atomic energy, and space". The remainder of the article presents some of the immediate needs of the Postal Office, including laboratory facilities and areas (electronics, coding, human factors, optical character readers, and computer applications) requiring R&D.

IV NATIONAL R&D PROGRAMS

47. "Future NASA Space Programs", Hearings before the Committee on Aeronautical and Space Sciences, United States Senate, Ninety-First Congress, First Session, 5 August 1969, 70 pp.

The testimony in these hearings was concerned with the objectives and expected costs of NASA's future space programs. "Areas of particular interest are: manned lunar exploration; the Apollo Applications Project; NASA's plan for a large manned space station and an associated space transportation system; planetary exploration; and plans for astronomy, bioscience and space applications". Testimony was presented by Thomas Paine (Administrator, NASA), John Naugle (Associate Administrator for Space Science and Applications), Wernher von Braun, (Director, George C. Marshall Space Flight Center), and George Mueller (Associate Administrator for Manned Space Flight). In addition, a series of questions and NASA's responses to them are included; the questions deal with such topics as Apollo program costs, planetary exploration, views of science agencies on space projects, and Soviet manned space flight intentions.

(The Hearings are available from the U.S. Government Printing Office, Washington, D. C. 20402)

48. "Men on the Moon: An Assessment", Bulletin of the Atomic Scientists, v. XXV, no. 7, September 1969.

This issue of the publication is devoted entirely to an assessment of the manned lunar landing. It focuses "on the impact upon science, technology and international cooperation of man's emergence from the...Earth". The issue is divided into four parts; the papers presented in each part are cited below:

Part I: THE MOON AND MAN

Man Moves Into the Universe - Sir Bernard Lovell
Human Consequences of the Exploration - Freeman Dyson
Will Man Heed the Lesson? - Eugene Rabinowitch

Part II: THE POLITICS OF SPACEFARING

The Columbian Dilemma - Sidney Hyman
An American "Sputnik" for the Russians? - Charles S. Sheldon II
Lunar Landing and the U.S.-Soviet Equation - Mose L. Harvey
Prospects for Cooperation on the Moon - Philip M. Smith
A Look Into the 1970s - William Leavitt

Part III: THE FUTURE OF LUNAR STUDIES

Origin and History of the Moon - Harold C. Urey
The Evolution of Lunar Studies - Irving Michelson
Theories of Lunar Formation - John A. O'Keefe
A View From the Outside - Thornton Page
Investigation of the Moon: 1970-71 - George E. Mueller
Beyond Apollo Where? - Space Science Board, National Academy of Sciences

Part IV: THE TECHNOLOGICAL IMPACT

Industrial Impact of Apollo - Franklin A. Long
Saturn/Apollo as a Transportation System - Wernher von Braun
A Pattern for Problem Solving - Ernst Stuhlinger
The Apollo Hippocrates - Sidney Sternberg

49. Normyle, W.J., "Mars Options Key to 1971 Budget", Aviation Week & Space Technology, v. 91, no. 21, September 22, 1969, pp. 22-24.

"President Nixon is expected to endorse a proposed U.S. goal of landing men on Mars before the year 2000, possibly 1986: The President is evaluating that recommendation and two alternatives given to him by a special Space Task Group he appointed... to study the direction and pace of post-Apollo manned space flight programs". "That recommendation...includes two basic options permitting a landing on Mars before the year 2000": (1) "Commit to a maximum-effort program that would rapidly increase NASA's annual funding, reaching a $9.4-billion level in Fiscal 1980 and a manned Mars landing in 1981-82." (2) "Support a gradual but steady increase in earth orbit and lunar-oriented operations to test spacecraft transportation systems capable of making the Mars mission in 1986. NASA's annual funding would be increased to $5.5 billion by Fiscal 1976 and reach a maximum of $7.6 billion four years later". "A third option, setting the lowest limits of proposed efforts in space, would defer any decision involving manned Mars flights until after 1990. It also would virtually wipe out a sustained U.S. manned space flight program". The remainder of the article discusses in detail each option and its implications for the future and presents opinions expressed by key people in NASA and the Space Task Group.

50. "Space Science Board Panel Lists Priorities for Unmanned Exploration of Outer Planets", News Report, National Academy of Sciences, National Research Council, National Academy of Engineering, v. 19, no. 7, August-September 1969, p. 4.

A recent Space Science Board report, "The Outer Solar System: A Program for Exploration", has recommended a "vigorous national program for exploring the outer solar system using unmanned spacecraft". According to the report, the program "can be developed for a fraction of the total cost of the NASA program". "Recommendations for specific trips to the outer solar system, as well as recommendations for developing the necessary technical means to accomplish them, were drawn up by a group of scientists who met...to study the physics of the outer solar system. The results of the study were endorsed by the Space Science Board and presented to the National Aeronautics and Space Administration. The scientists agreed with three goals set by a 1965 study panel of the Space Science Board...These goals are that investigations of the outer solar system should stress experiments that contribute to the understanding of the origin and evolution of the solar system, and the origin and evolution of life, and the dynamic processes that shape man's terrestrial environment". "Recognizing that exploration will necessarily focus on the planets themselves, the scientists pointed out that the time involved in actual flight will lend itself to study of the interplanetary medium. They urged the development of a balanced program that combines both planetary and interplanetary objectives. In addition to the scientific knowledge that would be gained from such investigations, the technological developments making the missions possible would have far-reaching consequences". The remainder of the article discusses in more detail some of the specific missions.

51. "Details of Five-Point Interim Marine Science Porgram", Executive Office of the President, National Council on Marine Research and Engineering Development, 19 October 1969, 5 pp.

"A five-point program to strengthen the Nation's marine science activities was announced...by Vice President Spiro T. Agnew, as Chairman of the National Council on Marine Resources and Engineering Development". The five areas that the Administration has selected for "immediate special emphasis in the next fiscal year pending development of a long-term program by the Administration and the Congress" are: Coastal Zone Magagement, Establishment of Coastal Laboratories, Lake Restoration, International Decade of Ocean Exploration, and Arctic Environmental Research. "Selection of the five priority programs followed an intensive Government-wide review of urgent needs of the nation in relation to marine affairs. These particular needs cannot await the result of longer range studies, the Vice President said". "Additional funding above current levels will be provided for implementing these programs. Primary responsibility for development of each program will be assigned to an appropriate Federal agency while studies of the Government's organization of marine science activities continue". Details of the plans for the five areas are presented.

52. "Maritime Industry Looks to Technology", Washington Science Trends, v. XXII, no. 25, 29 September 1969, pp. 147-148.

A major new R&D program aimed at upgrading the U.S. merchant marine capability "may be a part of the Nixon's Administration's new maritime policy and program, now in its final formative stages". The proposed R&D program - to be carried out by industry, research institutions and the federal government - would cost an estimated $32 million per year for non-nuclear phases, plus an eight-year program costing $344 million for nuclear development. Elements of the proposed program include:

- Marine Sciences and Technology: A 5-year, $64.4 million program, plus a nuclear program of $45 million
- Transportation Economics and Shipping Requirements: A 5-year program at a projected cost of $19.3 million
- Ship Systems Engineering and Development: A 5-year program costing $70.1 million, plus a nuclear program of $300 million
- Ship Systems Operations and Support: A 5-year program at an estimated cost of $15.4 million

Top priority projects within each of these areas are listed.

53. "Will NOAA Fade Away Quickly?", Industrial Research, v. 11, no. 4, October 1969, p. 43.

The problems and status of the proposed National Ocean & Atmospheric Agency (NOAA) are discussed. "The idea for NOAA came out of the President's Commission on Marine Science, Engineering & Resources earlier this year, and a subcommittee of the House Merchant Marine & Fisheries Committee followed up with hearings to examine the proposal. "Rep. Alton Lennon (D-N.C.), chairman of the subcommittee, has faced an uphill battle to get favorable - or, in some instances, any - opinion from witnesses representing the executive branch of government or industry. Lennon has spoken out during hearings he has chaired to explain the apathy: certain government agencies oppose NOAA in order to protect their vested interest; firms that do business with these agencies do not wish to be counted as their 'enemies' for fear of losing future government contracts. The problem exists because NOAA, once established, should absorb the Coast Guard and the Environmental Science Services Administration, among others. Immediately, the toes of the two giant departments, Transportation and Commerce, were callously stubbed. The Dept. of Transportation, a 3-year old governmental infant itself, reacted sharply to the suggested relocation of the Coast Guard, which DOT managed to gather from the Dept. of the Treasury a short time ago. Equally, the Dept. of Commerce, which already had 'lost' a number of its bureaucratic arms to DOT when it was established, did not look kindly on the proposal to give up ESSA, which it created just a short time ago". "NOAA's future is unclear and will remain so until dialogue begins".

54. Watkins, H.D., "SST Faces Congressional Hurdle", Aviation Week & Space Technology, v. 91, no. 13, 29 September 1969, pp. 16-18.

President Nixon's decision to seek government funds for the construction of two prototype supersonic transports will be put before the House and Senate. "Nixon said he would request" $96 million for Fiscal 1970, which would be combined with a $99-million carryover from the $623 million that Congress has already approved for the supersonic transport project"; the estimated government funding for Fiscal 1970 would be $195 million. "Upon receipt of the strong presidential backing for the program...Boeing...said it would immediately start committing an $10-12 million in company funds for production facilities". "The total cost of the program through the prototype phase, including earlier design stages, will amount to $1.5 billion. This will be split about 85% government, 11% contractor and 4% airline funds. The government plans to recoup its money through royalies on the sale of the aircraft, with its $1.3 billion total investment to be returned with the 300th sale. Congressional appropriation requests are estimated at $189 million for Fiscal 1972, $48 million for Fiscal 1973 and $15 million for Fiscal 1974. Total new appropriations required for the prototype phase, including Fiscal 1970, is $662 million". "Taking of sides is expected to remain largely bipartisan, with much opposition centering on sonic boom fears and objections to spending money on the aircraft instead of other national needs such as welfare, schools and other liberal-oriented programs". The remainder of the article discusses program and policy positions, private funding sources and the opposition to supersonic flights over populated land areas.

55. Johnson, K., "Nixon Sets Aeronautic Research Timetable", Aviation Week & Space Technology, v. 91, no. 21, 22 September 1969, p. 29.

"Nixon Administration has set a timetable for development of a long-range national program for civil aeronautics research and development. The initial blueprint is to be completed by mid-October, and the final report submitted to the President in January, 1971, jointly by the secretary of transportation and administrator" of NASA. "The first plan, which will supply some guidelines for this fall's budget formulations, will be primarily an evaluation of the vast amount of existing information and projections on air transportation, airways and airports". The basic questions of the study are: (1) "What benefits accrue to the nation from civil aviation and aeronautical" R&D? (2) "What should be the pattern of civil aviation within the overall transportation network?" (3) "What level of aeronautical research is required to support U.S. civil aviation leadership, and what portion should be government-financed?" "The study is structured in four steps. There will be three cycles of these four steps. Following the first cycle, scheduled for completion in mid-October, the second cycle is to be complete Mar. 31, 1970, and the third, Sept. 30, 1970". These are the topics of the four steps: Civil aviation transportation requirements; Systems requirements; R&D requirements; and R&D policy. "As the study proceeds through three cycles of these four steps its impact on budget and other decisions of the Nixon Administration will increase".

56. "Plan for U.S. Participation in the Global Atmospheric Research Program", U.S. Committee for the Global Atmospheric Research Program, Division of Physical Sciences, National Research Council, National Academy of Sciences, Washington, D. C., 1969, 79 pp.

The plan for U.S. participation in the international Global Atmospheric Research Program (GARP) is presented in this document. The overall objective of GARP is to attain "economically-useful long range weather prediction". "In support of the major international goal of conducting a first global data gathering experiment in the mid-1970's, and in furtherance of the study of the physical processes which are of vital concern to GARP, the following U.S. subprograms are proposed: Observing Systems Simulation Experiments, Global Observing Systems Pacific Test, Tropical Cloud Cluster Experiment, Boundary Layer and Convection Experiments, Clear Air Turbulence Experiments, and Numerical Modeling Experiments". The report consists of chapters that review the background, objectives and rationale of GARP, examine the problems and prospects of atmospheric prediction, outline a program for the development of a global observing capability, discuss the major scientific problems, and present the recommended U.S. program.

(The report can be obtained from the National Academy of Sciences, 2101 Constitution Ave., N. W., Washington, D. C. 20418.)

57. "Plowshare Program During 1968", Based on the Annual Report to Congress for 1968 of the U.S. Atomic Energy Commission, United States Atomic Energy Commission, 1969, 8 pp.

"During 1968, progress was made toward demonstrating the feasibility of using nuclear explosions for peaceful uses, specifically for large-scale earthmoving and the stimulation of low-producing natural gasfields. Three nuclear cratering experiments were conducted with a high degree of success and the first joint Government-industry Plowshare experiment for stimulating natural gasfield production yielded valuable preliminary gas flow data. Advances were also made in reducing the amount of radioactivity produced by nuclear excavation explosives." The brief report contains separate sections on nuclear excavations, underground engineering, natural gas stimulation, and other underground engineering proposals (oil shale development, copper extraction, and storage areas for gas and water).

(The report can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C., 20402 - Price 15 cents.)

V SCIENCE, EDUCATION, AND THE UNIVERSITY

52. "DuBridge Sees Continued University Aid", Washington Science Trends, v. XXII, no. 24, 22 September 1969, p. 142.

> "Presidential Science Adviser Lee A. DuBridge believes that, despite current budgetary problems, the Federal Government will provide 'continued and continually enlarging support' of science and engineering in universities". "DuBridge made his comments at a recent symposium at Newark State College, N. J. sponsored by Esso Research and Engineering Co. In other areas of science and engineering, the Presidential aide predicted": 1) "The Federal Government will continue to support technology of specific national interest 'not yet suitable for being taken over by the private sector", such as nuclear power generation; 2) "Other areas of technology 'seem destined to remain primarily a Federal responsibility.' Among these are wholly new technologies for air traffic control, including possible multiple satellite navigation systems; space exploration and the development of space technology to meet national needs in such fields as meteorology, observation and surveys of agriculture, forest and earth resources"; 3) "Marine science and technology, which now receives approximately $500 million in Federal support, does not yet comprise 'a totally adequate national program' and the Nixon Administration is considering improvements which have been suggested"; 4) "Environmental problems will 'command major attention throughout the nation in coming years, constituting a national problem of staggering proportions in which all elements of our society must be involved".

53. Fagin, B. and Marshall, T., "Graduate Science: A Tale of Two Universities", Scientific Research, v. 4, no. 19, 15 September 1969, pp. 26-27.

> "A generous flow of federal funds during the decade of the '60s encouraged the growth of graduate science programs at U.S. universities and fostered a steadily rising output of Ph.D.s. But last year Congress did an about-face, lowering a very sharp axe on funds for graduate science education". The impact of these reductions on two universities - Northwestern and Stanford - is briefly discussed. At Northwestern NSF and NASA programs have been cut or cancelled; no students already enrolled have suffered a loss of personal support, although sizeable cuts in the enrollment of graduate students are anticipated. The expansion program of the physics department has been particularly hurt by the money shortage, "the

amounts of money per contract were down about one-third from what they would have been without the federal budget squeeze," and "the high-energy physics program is being phased out because it has so little financial support". At Stanford, administrators and professors envision the future as "increasingly dim" and "very bleak". The financial strain in graduate science education at Stanford resulted from cuts by the Defense Department, the National Institutes of Health, the National Science Foundation, and the National Defense Education Act. Although the University has made up these losses itself '...the obvious result of all this will be a drastic reduction in graduate enrollment. The University can't afford to subsidize graduate science education by itself'.

54. Kramer, J.R., "House Threatens Unrestful Colleges", Science, v. 166, no. 3902, 10 October 1969, p. 197.

"The House of Representatives has aimed an angry jab at colleges and universities in which there have been student disturbances about military presence on the campus. A section of the House military procurement authorization bill, which passed the House by an overwhelming vote on 3 October, would hold up all Department of Defense research contracts or grants to a university or a university employee until 60 days after the filing of a report with Congress. The report, which presumably would be filed by the Defense Department, would state, among other things, 'the record of the school, college, or university with regard to cooperation on military matters such as the Reserve Officer Training Corps and military recruiting on campus.' There is nothing in the bill indicating what Congress might do if it were dissatisfied with one of these reports, and it is not clear what Congress could do. The Senate version of the military authorization bill did not include this provision, and a House-Senate conference committee was to decide whether the provision would become law. Both the Defense Department and the White House Office of Science and Technology opposed the reporting provision."

VI SCIENCE MANAGEMENT AND POLICY-MAKING BODIES

51. Carlson, J.W., "Economic Analysis and the Efficiency of Government", Statement before the Subcommittee on Economy in Government, Joint Economic Committee on Economic Analysis and the Efficiency of Government, Washington, D. C., 30 September 1969, 11 pp. (plus attachments).

> The current activities and plans of the Budget Bureau in the area of policy analysis and program evaluation are presented and briefly discussed in this report. Many of the cited policy issues and programs under study are within the "science policy" and "science and public policy" matrix. These include: "Strategy for NSF's applied research program"; "International cost-sharing for space programs"; "International cost-sharing in high energy physics"; "Health services research and development in the Department of Health, Education, and Welfare"; "Future level of NSF's direct training programs in the light of the reduced rate of expansion of Federal research"; and "Priorities (and international cost-sharing) in astronomy". (These and other issues selected for study are estimated to have 'a budgetary impact of $50 million or more in fiscal year 1971 and/or $500 million during the next five years or an equivalent social impact'). Also presented are "progress reports" on four experimental projects "aimed at improving program evaluation and planning", one of which is the "Social Achievement Indicators Project".
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> (The paper can be obtained from Dr. Jack W. Carlson, Bureau of the Budget, Washington, D. C. 20503.)

52. "Cost-Sharing for Research Contracts Too?", Scientific Research, v. 4, no. 21, 13 October 1969, p. 9.

> "Two major changes in the federal government's sponsorship of research are in the offing this year or next: (1) The principle of universities and research institutions sharing with the government the costs of doing federally sponsored research may be extended to research contracts; at the present cost-sharing is mandatory only for research grants. (2) Grants and contracts as mechanisms of research support may be replaced by two new-style research agreements, (A) covering research in which there is little agency control, and (B) where there is much control. A third research agreement (C) would cover the vague ground between the first two. Use of all three by the agencies would be voluntary. The extension of cost-sharing is contained in an amendment written for the Senate appropriation bill for the National Science Foundation, NASA, and the other so-called independent agencies". A study of this proposal by the Budget Bureau concluded "that it is impractical to have an ideal research agreement to cover all types of research - whether highly controlled by the

government agency or not - and that the three types of model research agreements should replace the grant and contract system". The three types of "agreements have been accepted in principle by the federal agencies".

53. Lepkowski, W., "The Daddario Subcommittee: An Assessment", Scientific Research, v. 4, no. 18, 1 September 1969, p. 17.

Emilio Q. Daddario's House subcommittee on science, research & development "has demonstrated an extraordinary capacity for conducting inquiries into subjects scientific". "But how much power and influence does it have in Congress and in Washington? The answer is simple: scant. The subcommittee's fame runs strong and far through the national science community but its influence in Congress is still undeveloped. For one thing it's only a subcommittee. For another, it's a subcommittee of a standing committee that is hardly a powerhouse itself - the Committee on Science & Astronautics. The House Ways & Means Committee, as an example of congressional power, virtually dictates tax policy in the House of Representatives. The Daddario subcommittee dictates nothing. It talks about science, it debates science, and it develops information on science. The power it envisions for itself is largely educative, although it has been the starting point for several pieces of legislation, most notably the bill last year to reorganize NSF". Ivan L. Bennett, deputy director of the Office of Science & Technology under Donald Hornig, "probably speaks for most science-policy experts when he says of Daddario's group: 'The subcommittee has done a superb job trying to find out what's going on [in science]. We don't have anything like it anywhere else, inside or outside of the government'".

54. David, H., "Behavioral Sciences and the Federal Government", American Psychologist, v. 24, no. 10, October 1969, pp. 917-922.

The "growing public visibility of the behavioral and social sciences" is discussed and recent efforts directed toward forming public policies for these sciences are reviewed. "The social and behavioral sciences...have recently been the objects of increasing public interest, concern, and scrutiny"; one reason cited for this is the extent to which "these sciences have come to be supported out of public resources" and "the degree to which their further development is dependent upon...federal policies and programs". Recent congressional interest in the behavioral and social sciences are cited, and three reports dealing with policy matters are briefly reviewed: The Behavioral Sciences and the Federal Government (National Academy of Sciences, 1968), Knowledge Into Action: Improving the Nation's Use of the Social Sciences (National Science Foundation, 1969), and

Behavioral and Social Science: Outlook and Needs (National Academy of Sciences and the Social Science Research Council - to be published in November 1969). The major policy issues raised in the first of these reports, and the associated recommendations offered, are presented.

55. "Shannon Blasts HEW for Failure to Lead Medical Research Manpower", Scientific Research, v. 4, no. 21, 13 October 1969, p. 10.

"In a special report prepared for the Senate subcommittee on government reorganization", former NIH Director James A. Shannon "raps the Department of Health, Education & Welfare for failing to take the lead and coordinate national goals in research, manpower, and services. His criticism of medical research policies as such takes up only a small portion of the report. But flowing through the document is the theme that all health-related policies should be looked upon as one system, with research and education a critical part of that network. Yet, he says, Congress and the Executive Branch blithely preside over some 23 health agencies whose programs overlap, conflict, and grow like Topsy. He deplores, moreover, the 'intellectually dishonest' analysis of health programs turned out yearly by the Budget Bureau. And he betrays a sadness over the events that have swept his former agency, NIH, out of the leadership spot in health planning and decision-making". "Shannon recommends four moves to establish health goals in the federal structure:" (1) "A policy-making focus within HEW to develop short-, middle-, and long-range health goals, all to be reviewed yearly". (2) "A 'clean limbed' reorganization of HEW...to impose discipline on its own programs and agencies and to give overall guidance to health policies in agencies outside the Department". (3) "Firm decisions on proper distribution of federal funds based on health, as opposed to other social goals". (4) "Establishment of an undersecretary for health in HEW, with four assistant secretaries for science and education, health services and resources, regulatory activities, and program planning and analysis".

56. Ayres, R.U., "Technological Forecasting and Long-Range Planning", McGraw-Hill Book Company, 1969, 237 pp. ($12.50).

The forecasting and planning of technological change is the subject of this text. The major techniques of forecasting are described and appraised, and the relationships between forecasting and planning (of various types and levels) are delineated. The contents of the book include:

- Failures of Technological Forecasting (examples and causes)
- Epistemology of Forecasting (types of forecasts and validity criteria)
- Dimensions of Technological Change (cultural, economic, diffusion, and innovation)

- Morphological Analysis (description, illustrations, and uses)
- Extrapolation of Trends (curve fitting, envelopes, limitations)
- Heuristic Forecasts (extrapolation and projection, analogies, phenomenological and operational models)
- Intuitive Methods of Forecasting (experts, man-man and man-machine interactions)
- Policy and Strategic Planning (normative forecasting, cost effectiveness, PPBS, demand-oriented planning)
- Tactical (Operational) Planning (utility, system analysis, planning loop)
- Future Research Planning (pure and applied, measures of value, research and technological objectives)

VII SCIENCE, FOREIGN AFFAIRS, AND NATIONAL DEFENSE

34. "Science-Foreign Affairs Study", Science, v. 166, no. 3902, 10 October 1969, p. 199.

> "A House foreign affairs subcommittee, chaired by Representative Clement J. Zablocki (D-Wis.) is conducting an 18-month study of the operations of government in dealing with international issues and problems of a scientific nature. One of the main purposes of the study is to determine how U.S. foreign policy can be improved to keep in stride with international technological and scientific innovations; the study will focus in particular on the way in which the State Department uses diplomacy to solve international scientific problems. The study is being conducted by the Legislative Reference Service of the Library of Congress at the request of the House Foreign Affairs Subcommittee on National Security Policy and Scientific Developments. The first phase of the report, which includes an annotated bibliography of published materials on the topic, is expected to be completed by the end of the year".

35. "Educational TV for India", Nature, v. 224, no. 5215, 11 October 1969, pp. 100-101.

> "It was recently announced that the United States will cooperate with India in setting up a satellite system for bringing educational TV into 5,000 Indian villages". "Under the agreement with India, the sixth of NASA's series of Applications Technology Satellites will receive TV programmes transmitted from a ground station at Ahmedabad and relay them to small village receivers. The programmes will be under Indian control and are expected to be directed at family planning, education in agriculture and to make a much-needed contribution to Indian unity. Direct broadcasting to village receivers is made possible by an increase in the power which can be provided on Geostationary satellites, and by a highly directional aerial, which in turn means that the receivers on the ground can be modest and inexpensive. The satellite will not be launched until the middle of 1972, and it will be some time after that when the efficacy of the system is known. Limited experiments with conventional TV broadcasting to villages around New Delhi suggest that there may be a bright future ahead".

36. "ACS Links with Germans in Information Network", Chemical & Engineering News, v. 47, no. 40, 22 September 1969, pp. 15-16.

> "The American Chemical Society and its German counterpart Gesellschaft Deutscher Chemiker (GDCh) formally ratified an agreement to unite their efforts in processing secondary chemical and chemical engineering information". "GDCh becomes the third node of what is envisioned as an international chemical information network containing five or six major, computer-based input centers around the world". "More than 70% of the material processed by CAS originates outside the U.S. and more than 60% of the users of CAS publications and services are overseas. Hence, the need for decentralized centers throughout the world". "German input to the CAS system will start on an experimental basis early next year with abstracts for a limited number of Western German journals" and "will be gradually expanded to include all chemical and chemical engineering literature, including patents, that originate in Germany. Ultimately GDCh expects to supply complete abstracts and index entries in machine-readable form". Cooperation on an informal basis between CAS and 12 European chemical firms making up the Internationale Documentationsgesellschaft fur Chemie has resulted in "sufficient compatability between computer systems to permit development of direct exchange of machine language data between the two systems".

37. "Arms Control of the Seabeds", Science, v. 165, no. 3900, 25 September 1969, p. 1338.

> "The U.S. government recently indicated a willingness to compromise on an international seabeds arms control treaty now under discussion at the International Disarmament Conference in Geneva. Arms Control and Disarmament (ACDA) officials say the U.S. will probably agree to a Soviet proposal for a 12-mile offshore limit beyond which the seabeds arms control treaty would not be effective, rather than the 3-mile limit which the U.S. had originally proposed. The U.S. proposal is regarded as a response to a Soviet offer last month to modify its earlier demands for a complete demilitarization of the seabeds, a position which U.S. officials said was 'much too sweeping'. The U.S. had proposed that the treaty ban only nuclear weapons and other weapons of mass destruction, implying chemical and biological weapons. This plan would allow the U.S. Navy to maintain antisubmarine sensor tracking devices".

38. "U.S., France to Pool Ocean Studies", Scientific Research, v. 4, no. 20, 29 September 1969, p. 13.

> "France and the U.S. may join in a cooperative 'sealab' project with the participation of famed Frence oceanographer

Jacques-Yves Cousteau. The project may come as a result of a quietly arranged oceanographic entente formulated last February. Talks between the two countries will center on coordination of research". "In addition to oceanography, areas of joint research may include space studies with scientific satellites. The two countries have been exchanging oceanographic research results for years. The entente, agreed to last February, covers more formal cooperation in five areas: development of a cheap fish-protein concentrate; working and living at great ocean depths; construction of automatic measuring buoys; the study of ocean pollution; and the training of oceanographers. The formal collaboration is believed to be a result of President Nixon's visit last spring with the then French President, Charles de Gaulle. Nixon and de Gaulle agreed to an exchange of visits by their top science advisers. As a result, Lee DuBridge. Nixon's adviser, is visiting France this month. Bernard Laffey, French secretary of state for scientific research, will come to Washington toward the end of the year to firm up plans for a series of cooperative projects. It is possible that the new cooperation will develop into an American link with France's Pre-Continent IV project, scheduled for 1972, which will place a team of 10 men about 2,000 ft. beneath the surface of the ocean in an ocean-floor dwelling".

39. "Case History of the Vietnam Defoliant Controversy", Science, v. 166, no. 3402, 10 October 1969, p. 199.

"A study of the military use of defoliant chemicals in the Vietnam war and the attitudes of U.S. scientists concerning its use has been published by the House Science and Astronautics Committee. The study, which was prepared at the request of Representative Emilio Q. Daddario (D-Conn.), is a historical record of a 3-year ongoing debate over the use of weed-killing chemicals as a warfare weapon. The report centers upon the process by which the American Association for the Advancement of Science undertook to assess the ecological effects of the military use of chemical defoliants and herbicides in Vietnam. The report was prepared by the Science Policy Division of the Legislative Reference Service in the Library of Congress".

VIII SCIENCE POLICY IN FOREIGN COUNTRIES

International

151. "La política cientifica en América Latina" ("Science Policy in Latin America"), Estudios y documents de política científica (Science Policy Studies and Documents), No. 14, Unesco, 1969, 178 pp.

This report, published in Spanish only, is the proceedings of the second conference on science policy in Latin America, which was held in Caracas in December 1968. The bulk of the report is devoted to a description of the activities, organization, and resources involved in research and technical education in 13 Latin American nations (Argentina, Bolivia, Brazil, Colombia, Chile, Ecuador, Jamaica, Mexico, Paraguay, Peru, Uruguay, Venezuela, Central America and Panama). Also included are recommendations adopted at the conference covering such topics as the development of national science policies, criteria for research priorities, collection of statistics on research activities and resources, advanced education, the application of science and technology to development, and regional cooperation in science and technology. A third conference on science policy is recommended for 1971-1972.

(The report can be obtained from the Unesco Publications Center, 317 East 34th St., New York, N. Y. 10016. Price: $3.50).

152. "Science in a Changing Asia", Impact of Science on Society, Unesco, v. 19, no. 1, January-March 1969, 101 pp.

The entirety of this issue of Impact is devoted to papers presented at the August 1968 Conference on the Application of Science and Technology to the Development of Asia (CASTASIA). Contents include:

- Profile of a Development Conference - Yvan de Hemptinne
- Moving Asia Forward - Indira Gandhi
- Social Factors Affecting Science and Technology in Asia - Jan Dessau
- Scientific Research Institutions in Asia - Leon Peres
- The Netherlands: A Mirror for Developing Countries - Jacob Hamaker

- Iran: Science Policy for Development - Majid Rahnema
- Unemployment of Engineers in India - Malcolm S. Adiseshiah
- Harnessing Science to Development in Thailand - Frank G. Nicholls and Pradisth Cheosakul
- Education and Research in Pakistan - Mohammed Ali Khan
- Korea's Strategy for Science and Technology - Kee-Hyong Kim

(This issue of Impact can be obtained from Unesco Publications Center, P.O. Box 433, New York, N. Y. 10016. Price: $1.00).

153. Dessau, J., "Social Factors Affecting Science and Technology in Asia", Impact of Science on Society, v. 19, no. 1, January-March 1969, pp. 13-24.

The author considers "the social and human conditions required for the implantation and application of science and technology" in Asia. The "factors affecting the recruitment, the work, and the external relations of scientists, engineers and technicians", are discussed and an "overall analysis of society in order to define the zones within which practical policies might have some effect on the social conditions" is presented. Whereas "the Asian societies are able to accept modern science and technology without any major difficulty other than that of communication, the changes in cultural attitudes ... are resisted by the ... existing national cultures and their power of persistence". "Progress will be more likely in so far as the analyses and solutions employed accept that modern science and technology can be implanted in various cultural contexts and with various types of social organization". The author concludes that "it would probably be most useful to develop a specific sociology of the application of science and technology, one of the first tasks of which would be to undertake localized studies on the motivations, aspirations and attitudes of the various social categories involved in the advance of technology, on the composition of such groups, on their reciprocal relationship, on the phenomena of bureaucratization, etc. These empirical and analytical studies would help to determine what action could usefully be taken".

154. Peres, L., "Scientific Research Institutions in Asia", Impact of Science on Society, v. 19, no. 1, January-March 1969, pp. 25-46.

"This is a large overview, based on a survey, of the research institutions and research activities in fourteen countries in

Asia. Weaknesses and strengths in their science programmes are indicated and comparisons are made with the programmes in Asia's three science leaders, India, Japan and Pakistan". The author then questions the use science policy bodies can make of such survey data and questions the view of "science councils" as the best means for formulating science policy. Peres says that "survey results must be interpreted by those with knowledge about a wide range of national activities, able to judge national needs and to draw them all together to form a normative judgment of what ought to be done. In the national setting this is often the function of a science policy council". However, "[L]ending political authority to a group of scientists through their appointment to a science council might very well result in dangers ... the dangers will be compounded if the council has operational as well as advisory responsibilities and could negate the scientists' aspirations and frustrate the politicians' expectations about the contribution of science to development". "This is not to question the need for a positive science policy nor the urgency of focusing scientific research on the problems of change and growth. It is simply questioning whether a science council is the most suitable organizational form to allow scientists to discharge their roles in the policy process effectively".

155. Hamaker, J., "The Netherlands: A Mirror for Developing Countries", Impact of Science on Society, v. 19, no. 1, January-March 1969, pp. 47-52.

Using the experience of the Netherlands as background, the author discusses some of the problems and possible approaches for applying science and technology in developing nations. Among the questions considered are the following: "How can the results of research be moved out of the laboratory for application in industry and agriculture? Which brings the highest returns, innovative research or improvement research? What is the right mix combining original research and development and the buying of foreign licences?". In respect to the first question, the author discusses the "climate necessary for development through the application of science"; this includes the type of education required and the "change in attitude of the population", as well as a realization of the costs of developing a new product. As for the second question, "industry needs ... consulting services that bring existing knowledge into a form that can be readily applied. This is improvement research". Buying "know-how" through licences is less costly and risky than undertaking innovative R&D, but improvement R&D must accompany this approach.

156. "Science and Development", Pilot Teams Project, Evaluation Conference, Organization for Economic Cooperation and Development (OECD), Paris, 1968, 260 pp.

OECD initiated a "Pilot Teams Project" to 'examine how scientific research and technology can best be related to national problems of production and social welfare, within the framework of plans and policies for the promotion and maintenance of an adequate rate of economic growth'. In 1967, a conference was convened to evaluate the Pilot Teams Project, on the basis of reports prepared by the teams for four countries -- Greece, Ireland, Spain, and Turkey. (The National Reports of the Pilot Teams, published separately for the four countries are available for $3.80 each). The proceedings of that conference are presented in this document. The main findings and conclusions of the pilot team reports are presented for each country along with comments and discussion from the conference participants. A summing up of the conference is presented, as well as a general discussion of the role of science in development aid, and an outline of the main conclusions from the conference.

(The report can be obtained from OECD Publications Center, Suite 1305, 1750 Pennsylvania Ave., N.W., Washington, D.C. 20006. Price: $3.80).

157. Salomon, J., "Science Policy and Public Affairs in Europe", Paper presented at a seminar held at the Program of Policy Studies in Science and Technology at The George Washington University, 4 December 1968, 23 pp.

Salomon discussed the shift in European science policy, emphasized the differences in features between the U.S. and European science policies and pointed out a trend that is common to both the U.S. and European countries. "The direction of shift in European science policy over the last few years has been marked by a trend from theory to concrete experience; from the stage of institutional recommendations to that of daily practice; from attempting to integrate scientific research into broad national goals to focusing policies more and more on specific fields". Some of the differences in features between the U.S. and European science policy emphasized include: disparity between R&D efforts; differences in the nature of the obstacles to be overcome (e.g., organizational and bureaucratic barriers, industrial attitudes, sizes of firms and the size of the market); political and economic considerations; disparity in educational and training systems; scarcity of financial and human resources devoted to R&D in Europe; diversity of national policies within Europe, "often conflicting and always difficult to adjust to each other". The trend that Salomon points out to be common to both the U.S. and European countries is the "growing dependence of research activities upon State support ... [is]

bring[ing] all the industrialized countries closer in spite of what separates them, whether for political or economic reasons". "In short, governments have learned, in Europe as in the United States, how to use science and technology as a tool. It would be difficult to say that they have succeeded in defining new goals that this tool might help to meet".

(The paper can be obtained from the Program of Policy Studies in Science and Technology, The George Washington University, Washington, D.C. 20006).

158. Caty, G., "Co-ordination of European Science and Technology", Science Policy News, v. 1, no. 2, September 1969, pp. 25-29.

The problems and prospects for European cooperation in science and technology are reviewed and discussed. "The principal feature of internation co-operation in Europe today is its diversity". "It is a Chinese puzzle in which all the components have only one thing in common, that they are in a state of crises". The problems, say the author, center around "a conflict of national interests about the aims pursued and the distribution of research effort". Lacking "common policy in the spheres they proposed to select for co-operation, the European countries have engaged in projects rather as if they were taking out an insurance against future contingencies". Although OECD has "provided a forum for the confrontation of national policies", it "has failed to mitigate the spirit of competition which has so far prevailed over that of co-operation". Looking to the future, the author assesses some of the proposed co-operative programs and examines some of the questions posed by these proposals. "The time has come ... to ask whether it may not be necessary to rebuild European co-operation on entirely new foundations and to redefine its objectives".

159. "Fund for Joint R&D Ventures", Industrial Research, v. 11, no. 4, October 1969, p. 49.

"A plan has emerged for a mixed capital structure investment organization in Europe aimed at financing joint industrial projects of an advanced technological nature among British and European firms. The idea was proposed at a meeting ... of a delegation from the European Parliament's Committee on Energy, Research & Atomic Problems and a group of British Parliamentarians and industrialists". 'This organization would raise funds in a variety of ways -- from cooperating governments, banks and finance houses, and from public issues. It would make appropriate term loans to international public or private enterprise consortia from two or more partners who, in turn, would be from two or more countries. The loans would be made to those who presented a clear case for a research or development project associated with an advancement in technology'. "Seven categories were cited in which European joint industrial projects would most likely succeed on 'medium-term pragmatic prospects rather than on advanced long-term visionary possibilities'". "The categories are: cryogenics, hydrofoil and hovercraft, inter-city transport including advanced rail, lasers, composite materials, oceanography, and vertical and short takeoff and landing craft".

160. "Hanging Together or Separetly", Nature, v. 223, no. 5212, 20 September 1969, p. 1192.

"A full-scale systems for Europe was called for by Dr. J. Defay of the Belgian Office for Science Policy Programming when he gave the opening address to a two-day conference on European Technological Collaboration in London". "Piecemeal approaches to European collaboration had failed, he said, and the time had come to accept that Europe could only progress by creating a single customs union, single institutions for the technologies like aircraft, nuclear power and computers and, finally, a monetary union. Surprising as it is ... the successes of American technology were a direct result of central planning, with public debate almost totally bypassed. But there are still ten to fifteen years in which to set up an independent Europe that will not be merely a second-hand export market for American solutions, American hardware and American vocabulary". The remainder of the article discusses Britain's withdrawal from the CERN 300 GeV accelerator project, and prospects for the proposed large EMBO laboratory.

161. Croome, A., "Europe Still Awaits Space Decisions", Science Journal, v. 5a, no. 4, October 1969, pp. 6-7.

The plan of development for European space, as outlined by the third European Space Conference (ESC), "is beginning to gather momentum but not without some major hesitations and not with the speed predicted". Although several firings of ELDO launcher vehicles have failed and future tests have been postponed, "the launcher organization itself and the future of the Blue Streak booster on which the programme is based are more secure than for years". With the clarification of the ELDO situation, high officials appointed by ESC have set about "drafting proposals for a merger of the three official European space bodies ELDO, ESRO and the Conference of European Telecommunications by Satellite (CETS)". ESRO has implemented a revived scientific programme including the launching of several satellites and supervision of "the design and construction of the applications satellites proposed by Anthony Wedgwood Benn as the major space endeavour for Europe". Also, the ESRO promoted Atmospheric Research Satellite aims "to combine pure research into atmospheric characteristics with the operational aspects of metsatellites", and "could make a contribution to the forthcoming Global Atmospheric

Research Programme (GARP)". Outstanding decisions regarding priorities for Europe's applications satellite programme "may well not emerge until the next European Space Conference which is due in the Spring of 1970".

162. Fink, D.E., "ELDO Studying Launcher Project", Aviation Week & Space Technology, v. 91, no. 9, 1 September 1969, pp. 43-44,46.

"European Launcher Development Organization (ELDO) has initiated a comprehensive two-phase study aimed at organizing a central project management team for Europa 2 launcher production and selecting a post-Europa 2 design for the 1980's". "The first phase has the most critical timing, since the Europa 2 launcher already is entering production. Early manufacturing work has started on the first operational launcher despite development problems which have been encountered with Europa 1". "In the second phase of its study, ELDO is looking at a wide range of advanced launched concepts which would be able to boost large communications and applications satellites". "The British government has reaffirmed its decision to withdraw from ELDO at the end of 1970 when Europa 1 development is completed". "Italy also has refused to assume a larger share because of a dispute over the distribution of work contracts. The four remaining European partners -- France, Germany, Belgium and Holland -- decided the Europa 1-2 development must continue, and agreed to share the additional costs. These four countries will form the nucleus of the group that will develop the advanced launcher, although an effort is being made to interest other European partners". The remainder of the article goes into detail about the approach to solving ELDO's program management problem, and the details of the launcher project itself.

163. "European Space: French Cutback", Nature, v. 223, no. 5212, 20 September 1969, pp. 1196-1197.

"Although the expected large cut in the French contribution to ESRO brought about by the new wave of financial stringency in France will be a setback, the organization is probably in better shape ... than ever before ... in its eight year history. France, nevertheless, pays 20 per cent of the ESRO budget, and the expected cut of 30 million francs in a contribution of 50 million francs which is foreshadowed in the present proposals will be a serious blow. A reduced level of expenditure on the French national programme of space research also seems likely. What ESRO officials must be hoping is that by the time the contribution has to be paid, the financial situation in France will have eased. The second instalment is not due for almost a year, in August 1970, leaving plenty of time for a wait-and-see policy, and France should have no difficulty in paying the first instalment due early next year". The next ESRO council meeting is late in November and "the optimistic view is that France may be persuaded to reconsider the cut". "The organization's level of resources for the three-year period 1969-71 has ... already been approved by a unanimous decision at last November's council, and approval of the 1970 budget requires only a majority decision by seven out of ten states to make it legally binding on all members".

164. "French, Germans to Build Big 'Scopes' ", Scientific Research, v. 4, no. 19, 15 September 1969, p. 15.

"The virtual explosion in the designing and construction of big optical telescopes continues -- with both the French and the Germans pushing ahead with new projects". The details of the French project are presented; however, the "details of the German research program have not yet been mapped out, but a focal point will be infrared astronomy, with particular emphasis on the origins of the stars". The Germans plan to build three observatories at a total cost of about $15 million. The French have decided to locate their 14-in. telescope in the Mexican Sierra de San Pedro Martir mountains in Baja California. "The telescope will be used to study quasars and very distant galaxies". "Two stumbling blocks, however, may delay progress on the instrument -- money and the great distance of Baja California from France. The cost of the telescope is estimated at $10 million, a large figure at a time when the Pompidou government is cutting budgets drastically and questioning all research not directly tied to economic development. A solution might be to make the telescope a joint French-German-Italian project, but the Germans consider Mexico too far away and the Italians want to have their own telescope". The remainder of the article briefly discusses the Italian and American plans for new telescopes.

165. Gillie, O., "Molecular Biology: Growth Pangs in Europe", Science Journal, v. 5a, no. 3, September 1969, pp. 11,13,15.

Two different proposals for the development of molecular biology laboratories are "being thrashed out in committee and a clash between them seems inevitable". The European Molecular Biology Organization (EMBO) proposed a large European laboratory, probably near Geneva, which would "provide facilities for research and teaching that could not be equalled by several smaller laboratories in a number of different countries" A number of scientists disagree with the concept of one large laboratory and feel that "'it would be ridiculous to put all the eggs in that basket'", that "'the emphasis of the project is wrong'", and that "'too much emphasis on particular aspects of molecular biology lead to an intellectual and financial monopoly of the field'". The UK's Council for Scientific Policy may accept a "split lab concept" as a compromise whereby EMBO would set a few small laboratories in several different European countries. "However, although a compromise of this kind might be agreeable to British scientists, the Europeans are much more strongly committed to the idea of a single large laboratory".

166. "List of Current National Publications", Science Policy News Supplement No. 1, Science of Science Foundation, July 1969, 12 pp.

The Supplement, published quarterly, is a bibliography of current books, reports and articles dealing with science policy. This, the first supplement, lists materials, mainly government documents, from several countries and organizations: Austria, Belgium, Canada, Demnark, France, Germany, Italy, Netherlands, Norway, OECD, Spain, Sweden, Switzerland, United Kingdom, and the USA.

(The Supplement can be obtained from the Science of Science Foundation, Benjamin Franklin House, 36 Craven House, London WC 2).

Austria

167. "Increasing National Research Effort", Science Policy News, v. 1, no. 2, September 1969, p. 29.

"The Federal Government [of Austria] intends to increase the proportion of the GNP spent on research from 0.61 per cent (1966) to roughly 2 per cent in 1976. This is to be achieved by joint efforts on the part of government and industry. In 1967, Federal expenditure on research was A.Sch. 750 million, appropriations for 1969 are already 915 million. Known rerequirements for 1970 have reached 1,200 million, of which basic research is to receive 474 million. For the first time, the Government is able to provide in its report a detailed overall picture of national expenditure on R and D, an essential for the elaboration of a long-term, co-ordinated policy for research".

Belgium

168. "Disequilibrium in Allocations", Science Policy News, v. 1, no. 2, September 1969, pp. 30-31.

This article, based on a statement by M. Théo Lefèvre (Belgium's Minister for Science Policy and Programming), reviews the country's science budget and discusses the disequilibrium between allocations to universities and to technological research. The 1969 science budget is FB 11,740 million, an increase of 14 percent over 1968. Some 60 percent of the total goes to universities and about 25 percent to technological research and international cooperation. The preponderance of funds going to universities, "is disturbing" because Belgian technological research is lagging and has not yet acquired either the scale or the orientation required". This "persistent disequilibrium" is "getting worse instead of better", "due to two circumstances beyond government control: first, the deterioration in European co-operation in science and technology, and secondly, the flood of young people into higher education".

Canada

169. "Towards a Science Policy", Nature, v. 223, no. 5212, 20 September 1969, p. 1192.

The Canadian Senate Committee on Science Policy is "nearing the end of a marathon investigation begun in March last year". "Hearings in Canada ended in June, and the indications are that the committee has found the control of Canadian science to be in as many hands as it is elsewhere. The committee received fifty-five briefs from Canadian government agencies, and Senator Lamontagne said that this indicated how diffuse the Canadian science effort is. It is no secret that the senator would like to see a streamlining of management of Canadian science, and one idea which has been put forward is for a Ministry of Science in overall control. But Canadian industry is also likely to come in for a good deal of criticism in the forthcoming report as the weakest sector of the Canadian scientific community. In the effort to increase Canadian expenditure on research and development from its current level of about 1.5 per cent of the GNP up to a target 2 per cent by 1972, it is industrial research and development which is hoped to show the greatest expansion". "To this end, the federal government has initiated seven major projects as a means of increasing the amount of research and development, and much discussion has centered around what kind of incentives would best stimulate industry. One problem is that much of Canadian industry is financed from the United States, and the crucial research tends to be kept in American laboratories".

170. "Canadian Policy Criticized", Nature, v. 224, no. 5216, 18 October 1969, p. 209.

"'The overall pattern of Canada's chemistry research and development appears to be characterized by a rigidity and lack of cooperation which are the result of the lack of an overall science policy'. This is the main conclusion drawn in an extensive report on Canadian chemistry, carried out by the Chemical Institute of Canada. The report does not confine itself exclusively to chemistry, however, but includes recommendations on general government policy for the whole spectrum of science. The report is also concerned that insufficient coordination exists between industry, government and the universities, and it recommends that consultation and the interchange of personnel between these sectors should be increased". "The report is also concerned that an imbalance exists between basic and applied research, and it argues for more effort to be put into applied research, while that in basic research should be maintained. Research institutes should help smaller companies to undertake research and development, by supplying some risk capital. More urgently, a thorough investigation should be made into the supply and utilization of scientific manpower. Again, this is a problem which has occupied many other countries, but this report suggests that the rate of graduation of PhDs will be sufficient to serve a rapid increase in research and development in Canada, the main problem being correct usage of the available talent".

171. Uffen, R.J., "Recent Changes in Government Organization for Science Policy", Science Forum, v. 2, no. 5, October 1969, pp. 3-5.

Two recent changes in the Canadian government's organization for science policy are discussed. The first of these was the establishment of the Privy Council committee on scientific and industrial research (PCCSIR) as a standing committee of the cabinet. Its function will be "to examine and coordinate advice from various sources and bring it before the cabinet in a form that can be understood and acted upon" by men who are not "necessarily scientifically or technologically trained". The appointment of "a chief science adviser to the cabinet was another step taken ... to establish machinery for bringing scientifically oriented proposals before the cabinet and its committees, and getting decisions made on them. The chief science adviser is the secretary of the PCCSIR and, on most aspects of his work, he reports directly to the chairman of the PCCSIR. On scientific questions coming before the cabinet itself, he works as part of the Privy Council Office and through the secretary to the cabinet". He is also head of the Science Secretariat which is located within the Privy Council Office. The Science Secretariat "is a staff agency serving the cabinet. It is required to respond quickly to questions and queries from the prime minister and cabinet members and to get answers from the experts"; the "Science Council ... is responsible for assessing in a comprehensive manner Canada's longer-term scientific and technological resources, requirements and potentialities and for making recommendations on the adequacy, priorities, manpower, long-term planning, statistics, and information exchanges".

172. Basmajian, J.V., "What's Ahead for Science in Canada?", Science Forum, v. 2, no. 5, October 1969, pp. 31-33.

> "Forecasting the future of science and science policy for Canada is much simpler than it is for the United States. This is because Canadian trends in both the arts and science are locked into those of our more powerful and influential neighbours". "Following the lead of American developments in university affairs, general science, and applied science has become almost an immutable law. Thus, once we have determined what the phase-shift in timing is, we can predict almost exactly what our future will be". The time-lag between the two countries, the author estimates, is five to ten years. Several predictions about science and science policy in Canada are offered and discussed. They include: (1) "There will be a massive expansion in applied science and engineering". (2) "Politicians will insist on closer fiscal control of the research establishment". (3) "Training and research grants to university departments and institutes will become very important". (4) "Complaints about dictatorship by the establishment will become strident". (5) "There will be a sharp decline in the informal atmosphere of science". (6) "A large crew of relative failures will man the scientific vessel". (7) "The computer craze will be supplanted by another". (8) "The cult of pure research will change". The author closes by saying that his predictions "can be significantly altered by subtle trends I do not see; all could be destroyed by a catastrophe. Most are absolutely inevitable".

France

173. "A Long Term View of Research", Science Policy News, v. 1, no. 2, September 1969, pp. 31-32.

> "The Advisory Committee on Scientific and Technological Research has published a report on scientific research in France during the next 10 years (Prospective de la Recherche Scientifique en France, published in Le Progrés scientifique, Nos. 126, 127, 128, January, February, March 1969)". This brief article summarizes the Committee's report. R&D funding, the report recommends, should rise to 3 percent of the GNP by 1975 and 3.5 percent by 1980. Industrial research is expected to increase at a 4 to 7 percent annual rate (depending upon the growth rate of the GNP), with emphasis on industrial technology, materials, data processing, transportation, telecommunications, and housing. Basic and applied research should focus on applied mathematics and interdisciplinary areas (oceanography, space, biomedicine, agriculture); other areas of priority include socio-economic studies to

improve the productivity of industry, town planning, and road safety research. Also recommended by the Committee were a Standing Committee for Scientific Manpower, increased education research, and "an ad hoc working party to study ways of promoting mobility and retraining".

174. Greenberg, D.S., "France: Profit Rather than Prestige Is New Policy for Research", Science, v. 165, no. 3900, 26 September 1969, pp. 1334-1337.

After a 10-year period in which science and technology were expanded and venerated mainly to enhance national prestige -- and with little regard for economic payoff -- France is following the pattern of other countries which consider profit and payoff when funding research. The Pompidou government, viewing science and technology as more than instruments of national prestige, has amalgamated the previously separate Ministry of Science and Ministry of Industry into a new Ministry of Industrial and Scientific Development, which is headed by an economist and which has Cabinet rank. Labor leaders state that "the creation of the new Ministry reflects a desire to squeeze science as an institutionally independent activity and force scientists into positions in industry or the universities". Francis Bailly, head of the largest union of basic researchers, complains that "while the number of science graduates from the universities is increasing, the growth of funds to provide research positions for them in basic research is not keeping pace". "And we feel that profitability is a too narrow goal in determining science policy".

German Federal Republic

175. "Research Policy Guidelines", Science Policy News, v. 1, no. 2, September 1969, pp. 32-34.

The Third Federal Research Report of the German Federal Republic presents data on R&D expenditures and outlines major programs for the future. Total expenditures for R&D (including education and training) "amounted to about DM 14,000 million in 1968, compared with 11.4,000 million in 1966. This represents a rise from 2.4 to 2.6 per cent of the GNP. Expenditures on R and D alone rose from about DM 9,000 million in 1966 to about DM 11,000 million in 1968". "The Report provides information regarding developments in educational research, strategic studies, peace and conflict research, research into nutrition, problems of feeding the world's population, energy supply, oceanography, electronic data processing, modern biology, and new technologies". A "new technologies programme is designed primarily to promote technological research and development". Other topics covered include international cooperation, promotion of research by the Länder, R&D in industry, and research planning.

176. Marks, D., "West German Science Expands", Science Journal, v. 5a, no. 4, October 1969, p. 11.

"Extensive plans have recently been made public for the setting up of a number of new institutes in West Germany which, it is hoped, will significantly extend the scientific capability of the Federal Republic". "Two new institutes, one in Stuttgart and the other in Julich, are to be founded, each with its own distinct field of study, and a central curatorium will co-ordinate policy. The Stuttgart institute is to be under the auspices of the Max Planck Society, and will concentrate mainly on semi-conductors and non-conductors". "The Julich institute is to be attached to the existing nuclear research centre there and will take over and continue the investigations into the metallic properties of solid bodies by nuclear methods which are already in progress". "The foundation of these two institutes is expected to cost about DM 70 million". "Plans are also well advanced for the setting up of what is essentially a Max Planck Institute for Futures. Both the senate of the Max Planck Society and the Federal Government have approved the new institute in theory but the financial arrangements still have to be finalized".

177. Stein, B.R., "Academic Research in Germany: A New Support Program", Science, v. 165, no. 3898, 12 September 1969, pp. 1096-1100.

The Science Council of the Federal Republic of Germany recently released a report "dealing with the planned expansion of the universities until 1970". The report recommended the establishment of a "special research areas" program to support the formation of cooperative multidisciplinary research efforts. The German Research Association, "the principal national organization responsible for the support of academic research, agreed to advise the Science Council on the selection of special research area proposals and manage the operations of the program". "Although the university is considered the principal institutional pillar of the program, the state and federal governments provide ... important kinds of institutional links". For example, although "the nuclear and space research programs provide the universities with considerable sums these are for rather specific purposes. The general science promotion program, however, is the major supplier of funds to the universities. In fiscal year 1969 its budget will be approximately $260 million of which more than 70 per cent will be used for the construction and equipment of university plants". "Together both federal and state ... funds account for more than 80 per cent of all academic institution income". The remainder of the article discusses the details on proposal submission and selection procedures, implementation and financial arrangements, and the first list of approved research areas.

178. "The German Space Program", International Science Notes, International Scientific and Technological Affairs, Department of State, October 1969, pp. 6-8.

Germany's space program -- projects, organization, and funding -- is described and its major elements are listed along with associated funding levels. For 1969, the space budget is $88 million, with some $51 million going to the national program and the remainder in support of international programs. This amounts to about 16.5 percent of the total Science Ministry budget. The budget is expected to increase to $140 million by 1973. During the '69 to '73 period, the program will be directed to "extraterrestrial research, development of scientific and applications (communications, television, navigation, meteorology) satellite technology, and development of launcher technology in cooperation with other European countries". "Current plans include two German research satellites (AZUR) to measure the earth radiation belt and the density and composition of the higher atmosphere, both to be launched by U.S. rockets; the development of two solar probes (HELIOS) in cooperation with NASA; a research communications satellite (SYMPHONIE) to be developed jointly with France; participation in ESRO research programs and in the development of an ELDO launcher".

179. "German Marine Research Program for 1969-1972", International Science Notes, International Scientific and Technological Affairs, Department of State, October 1969, pp. 8-10.

Germany's planned program in oceanography for the 1969-72 period is briefly described, in terms of funding and program areas. Overall, funding over the period is expected to be about $75 million, with $33 million from the Science Ministry budget and the remainder from Laender and industry sources. Major elements of the program are: "Utilization of mineral resources in the sea, the sea floor, and beneath the sea floor"; "Utilization of marine food resources to cover rising protean demands"; "Abatement of pollution of the sea, especially in the coastal regions"; "Utilization of the reciprocal sea-atmospheric effects to improve forecasts of swells, storm tides, and ice formation"; "Control of natural phenomena on the coast and in coastal regions to solve ... problems relating to coastline protection and sea traffic". Other efforts include a system for gathering data on marine and atmospheric phenomena, and an inventory of international cooperation, problems, and laws in connection with marine research.

Iran

180. Rahnema, M., "Iran: Science Policy for Development", Impact of Science on Society, v. 19, no. 1, January-March 1969, pp. 53-61.

The author discusses the prerequisites of a "science policy geared to growth" in Iran, as well as other Asian countries, and describes some of the efforts and plans of the Iranian government in this direction. "If a science policy ... is the 'sum of measures taken to increase, organize and use the national scientific and technological potential', the prerequisite to the success and the proper implementation ... should be an over-all planning ... aimed at the free utilization of all the human and economic resources of the nation". "Moreover ... no science policy can fully achieve its aims if it is not planned and implemented within the framework of deep structural changes, and these changes should take place both in the socio-economic structures of the country and in the concept of scientific planning itself". Structural changes would include land reforms and other related changes to remove the basic barriers "to the utilization of the peoples' potentialities" and an attempt to reach "not only a group of elite scientists and researchers but to promoting the welfare and productive possibilities of the millions". Charged with the responsibility for developing such a science policy is the newly created Ministry of Science and Higher Education. The planned activities of this Ministry are cited, with particular emphasis on education reform. In conclusion, the author calls for regional cooperation in science and technology, and suggests some means for reducing the brain drain.

Ireland

181. "National Science Council: Annual Report 1968", National Science Council, Ireland, 1969, 16 pp.

This is the first annual report of the National Science Council of Ireland. The first of two major sections of the report summarizes the Council's activities during the year, "which are increasingly concerned with attempts to formulate a national plan for science and technology. The second section "looks at some factors or criteria of which account must be taken in the formulation of policy for science and and presents some thoughts on future problems and prospects". Some of the main areas to which the Council's activities were directed are grants for R&D in industry, grants for university research, science policy for economic and social development, International Biological Program, scientific and technical manpower, and resources devoted to R&D. The second section of the report, which is entitled "Towards a National Science Policy", discusses the aims to which an Irish science policy should be directed, briefly examines the question of identifying R&D priorities, and comments on the implications of technology gaps for Ireland's science policy. Future activities planned by the Council in these areas is briefly cited.

(The report can be obtained from C. Ó hEocha, Chairman, National Science Council, University College, Galway, Ireland).

182. Ó hEocha, C., "Science and Public Policy", Administration (Dublin), v. 17, Spring 1969, pp. 1-10.

Science policy matters in general are discussed with special attention to the policy recommendations of Ireland's National Science Council, a body recently created 'to advise the Government on Science and Technology, with particular reference to economic development'. By way of background, the author notes that Ireland's R&D expenditures rose from £3.8 million in 1963 to £6.1 million in 1967, which is about 0.5 percent of the country's GNP. Future plans recommended by the Council include: a new system of University Research Grants based on proposals from individual scientists and engineers; the build up of "focal centres of an inter- or multi-disciplinary nature in the universities which will develop strong links with applied laboratories, industry and agriculture"; increased development of food, health, and environmental sciences; means for encouraging the "concentration of technology in areas selected for development"; improved transfer of R&D results from state-sponsored laboratories to industry; financial support of industrial R&D by government; "a coordinating body concerned with the coupling of research, invention and development to productive technology"; and "science of science" studies for formulating a national science policy.

Israel

183. "New Look for Israel", Nature, v. 223, no. 5212, 20 September 1969, p. 1198.

A government committee has proposed a radical reorganization of the machinery for supporting research and development in Israel. The committee suggested: (1) "that there should be a central body with power to suggest the forward strategy for scientific research and to help the government to coordinate the claims of different agencies on the scientific budget", and (2) "that a good deal of the public interest in [R&D] should be channeled through existing ministries and that there should be set up three research agencies responsible for agricultural, environmental and industrial research respectively". The report provides an up-to-date survey of the distribution of effort in R&D, the sources of financial support, and technical manpower. "The thread running through the committee's argument is that the dominant role of government finance among internal sources of support for [R&D] should be reflected in a stronger central machine for formulating research policy". This authority "should have power and funds to stimulate research in those fields that are not directly the responsibility of government ministers". The report "skates around the perennial problem in Israel of whether the long-term national interest is best served by fundamental or applied research". "On policy for research in universities and similar institutions ... the committee has comparatively little to suggest".

Italy

184. "Italian Science Policy Condemned", Nature, v. 223, no. 5213, 27 September 1969, pp. 1304-1305.

A review by the Organization for European Cooperation and Development (OECD) "finds almost nothing right with Italian science policy -- pitiable funds, confused organization, reactionary professors are only some of the failings ..." "The two salient features of Italy's research budget are its size and its imbalance". Italy devoted only 0.9 percent of its GNP to R&D in 1967, with less than half provided from public funds; one-fifth of the funds go to nuclear energy, and an equal amount to international organizations, principally Euratom, CERN, ELDO and ESRO. "On the government level, the principal failing is the nebulous division of responsibility between the various organs concerned with the formulation of science policy. Chief of these is the National Research Council (CNR) which is loaded with a multiplicity of functions including both the administration of certain types of research and advising the government on science policy". Scientists are dissatisfied with CNR's membership and cumbersome machinery, as well as handicaps in its operation. "In the universities, the dearth of research funds is compounded by a shortage of research personnel at every level and an archaic structure which allows professors to behave as autocrats and offers no secure career to younger scientists". The OECD examiners recommended that "administration of the public service institutes ... be rationalized and simplified", and that "the Italian practice whereby the same body ... is charged both with doling out funds and setting the guidelines for science policy" be discarded.

185. "Technological Balance of Payments", Science Policy News, v. 1, no. 2, September 1969, p. 34.

> "The Office of Research Promotion of ENI (the State holding company for petro-chemicals) has completed figures made available by the Exchange Office and the Bank of Italy concerning receipts and expenditures for patents, licences and know-how during the period 1963-67 (ENI, Ufficio Promozione Ricerca scientifica, Bilancia dei Pagamenti technologici italiana per il periodo 1963-67, Relazione No. 8, 1969). They are broken down into seven sectors, by countries of origin, and destination. The Table below gives global figures".

	(in millions of lire)			Ratio receipts/ expenditure
Year	Receipts	Expenditure	Balance	
1963	20,361	86,257	-65,896	4.23
1964	24,487	98,670	-74,183	4.02
1965	27,104	97,268	-70,164	3.58
1966	30,251	113,818	-83,567	3.67
1967	38,307	119,907	-81,600	2.11

Korea

186. Kim, Kee-Hyong, "Korea's Strategy for Science and Technology", Impact of Science on Society, v. 19, no. 1, January-March 1969, pp. 93-98.

> After a brief synopsis of the present situation in the Republic of Korea, the author discusses the major policies presently being developed and implemented for the development of Korean science and technology, and offers some suggestions for Asian cooperation. "In strengthening governmental research activities and maximizing the effective utilization of existing research facilities, Korea is facing problems common to most of the developing countries. These problems are the shortage of necessary research equipment, the shortage of financial assistance and the shortage of research personnel. Since research facilities are scattered among many governmental departments, the nature of their research activities have remained small and routine in nature. The Ministry of Science and Technology is at present studying the measures needed to systemically organize the diversified governmental research facilities in order to make unified large-scale activities possible". A step in this direction is the Korean Institute of Science and Technology (KIST) which is "directly

related to Korean industry and has the financial support of both the governments" of Korea and America. KIST "will function as an integrated research organization providing the facilities and means by which research and developments programmes of both the government and private productive enterprises can be carried forward. It is expected to play the leading role in providing Korean industry with valuable technological research services so that difficulties which industry encounters can be resolved". "To promote improvement of the Asian region from within, and encourage co-operation from without", the author proposed the following four possible courses of action: exchange of scientific and technological personnel, periodic regional meetings of research scientists, effective documentation services in the region, and strengthening scientific instrument production and repair services.

Netherlands

187. "Interim Advice on Netherlands R and D Expenditure 1969-71", Science Policy News, v. 1, no. 2, September 1969, pp. 43-46.

The Science Policy Council of the Netherlands has submitted a report to the Parliament which "is a first approach towards a co-ordinated expenditure policy on scientific research". The report attempts to specify some of the general public goals to which science policy is relevant, estimates government expenditure for R&D through 1971, and suggests level of funding and priorities for "government objectives" in 16 areas. From 1950-66, government R&D expenditures "increased with an average of slightly over 22 per cent p.a., from DFl. 22 million to DFl. 797 million". (The estimated expenditure for 1968 is DFl. 933 million). "The Council stresses than an average annual budgetary increase of 15 per cent for government expenditure on R and D through 1971 will be essential". Some of the major 16 areas on which the Council offered advice were industry and commerce, space research and technology, nuclear energy and nuclear physics, agriculture and fisheries, promotion of scientific research, and defense. Future topics to be pursued by the Council include: policy for university R&D; optimal allocation of resources among basic research, applied research, and development; and continued efforts toward formulating a coherent science policy.

New Zealand

188. "Research and Development: New Zealand", Nature, v. 223, no. 5211, 13 September 1969, p. 1094.

> "The Department of Scientific and Industrial Research of New Zealand has just issued its annual report for the year ending March 31, 1969. The report shows that the department spent a total of $8,155 million (NZ) during the year, one third of it on the chemistry division, the Physics and Engineering Laboratory and the Geological Survey. DSIR supports research directly through its own laboratories in agriculture, ecology, food technology, industry and the earth sciences, as well as making grants for research conducted in universities, industrial research associations and other bodies". "An important change of organization in DSIR is the decision to transfer to it the Industrial Development Department of the University of Canterbury". "Its incorporation in DSIR should integrate it more closely with similar units in the department and encourage greater attention to research and development work. It will also provide headquarters in the South Island for expanded research facilities to industry, already provided by DSIR at Wellington and Auckland".

Sweden

189. "Sweden Spends $330-Million on R&D", Industrial Research, v. 11, no. 9, September 1969, p. 55.

> "Total spending on research and development in Sweden amounted to about $330-million, in 1967, according to the National Central Bureau of Statistics. Input of labor in these activities totalled some 25,000 man-years. A breakdown of R&D expenditures shows that industrial companies spent $210-million, central and local government authorities and institutes $32-million, industrial associations $43-million, universities and other institutes of higher education $47-million, and other sectors some $9.8-million. Among Sweden's industrial companies, about 1,200 carry on R&D activities, with companies in the electrical engineering and transport sectors predominant. In the former companies, $51-million were spent on R&D in 1967; in the latter, $48-million. Of the $47-million spent on research and development at universities and other institutes of higher education, $12.7-million were contributed by national research councils, $3.9-million by foundations, $98,000 by Swedish industrial companies, and $195,000 by funds from abroad".

Taiwan (China)

190. "Chinese Try to Plug Brain Drain", Scientific Research, v. 4, no. 18, 1 September 1969, pp. 17-18.

> "Taiwan has launched a two-pronged attack on its growing brain-drain problem. The Chinese plan calls for a professorial exchange program with the U.S. and the establishment of two new research centers on Taiwan, to be added to the five centers -- already in operation -- that also serve as graduate schools. It has been estimated that approximately 97 percent of the Chinese students who go abroad for postgraduate education fail to return. The primary objective of the program is to cut down this number drastically and even induce some of those students who have already left to return home. Under the program, the Chinese will make a special effort to encourage American professors of Chinese origin to come to Taiwan for periods of six months or a year. Chinese scientists will go to the U.S. to do research for similar periods. U.S. financial support for the program comes from the National Science Foundation, whose contribution depends on what Congress does to its fiscal-1970 budget". "The seven Taiwan research centers that are coupled with the exchange program cover these fields: biology, economics, chemistry, engineering, oceanography, physics, and mathematics. According to the Taiwan Government, most of them will give top priority to applied research in an effort to attract departed scientists and help plug the drain of talent".

Thailand

191. Nicholls, F.G. and P. Cheosakul, "Harnessing Science to Development in Thailand", Impact of Science on Society, v. 19, no. 1, January-March 1969, pp. 75-84.

> Thailand's experience with "harnessing science to development" is reviewed and discussed with respect to past problems and measures taken to overcome them. Some of the major problems cited were: "Science was considerably neglected ... expenditure ... was less than $100,000 per year"; "few scientists available"; scientists were considered civil servants and therefore subject to all restrictions (low pay, promotion by seniority instead of merit); "scientists frequently left research for administration just at the beginning of their most productive years"; "science had (and has) low prestige, largely for economic reasons"; "university science was not up to Western standards"; there was "little opportunity for graduate study at a Thai university"; "little research ... in ... universities". After a series of efforts

to coordinate the fragmented scientific effort of the country, the Applied Scientific Research Corporation of Thailand (ASRCT) was founded. The article describes in some detail the new principles on which ASRCT was founded, its structure, aims, functions, activities, international links, etc. The "development and operation of ASRCT are provided by the government in the form of an annual grant". In addition, supplementary assistance in the form of equipment grants and senior technical advisers has come from several agencies "under bilateral aid programmes". "The results of the Thai experiment are encouraging despite the constraints imposed by manpower shortages. Useful research results are already being achieved and careful steering is making sure that the research effort is oriented towards problems of immediate practical significance".

United Kingdom

192. "British Government Expenditures in Civil R&D for 1969-70", International Science Notes, International Scientific and Technological Affairs, Department of State, October 1969, pp. 10-12.

The United Kingdom Government's expenditure for civil R&D is expected to rise to $742 million (as compared with $580 million for defense R&D) during this current fiscal year which ends in March 1970. This represents a 10.6 percent increase over the 1968-69 level; R&D expenditures for defense are expected to decrease by 6.4 percent. The greatest portion of the Government's civil R&D goes to the four research councils: Science Research Council ($110 million), Natural Environment Research Council ($28.1 million), Medical Research Council ($41 million), and the Agricultural Research Council ($35.2 million). Percentage increases over 1968-69 funding for each of the councils are 9%, 27%, 12%, and 9%, respectively. Other major funding areas include industrial services ($41 million), aerospace ($223 million), atomic energy ($122 million), and international cooperative programs (e.g., ELDO, CERN, and ESRO). Tabular data on expenditures from 1966-67 through 1969-70 are presented for the above categories of civil R&D.

193. Gunston, B., "'Harsh Decision' for UK Science", Science Journal, v. 5a, no. 3, September 1969, pp. 9,11.

The "new" policy of the Ministry of Technology for funding civil science is presented and discussed. According to Minister A.W. Benn, 'we have set it as a major objective of our policy that science should be harnessed to the job of earning our living as a nation ... we have adopted a frankly commercial approach to our funding of science'. 'It is absolutely no good spending hundreds of millions of pounds on self-generated science projects or those which earn Nobel prizes and world acclaim if industrial competitiveness is neglected in the process'. "The Minister is already applying the 'frankly commercial approach' to the civil work of his own 22 labs". 'It is too early to say exactly what form we shall adopt' but it 'is increasingly being seen as one embodying a contractual relationship'. The main problem with "this major re-orientation of ... industrial research", says the author, is that it has to be "carried out at a time when the total amount of public money available is falling". The implications of this policy for the scientific community are discussed, and the risks involved are briefly noted.

194. "Policy Evolution", Nature, v. 224, no. 5215, 11 October 1969, p. 103.

The Science of Science Foundation is sponsoring a series of eight seminars entitled, "Evolving a New Policy for Technology". This article reports on the first of the seminars. The title of the seminar "suggests that there is already a policy to replace"; Douglas Hill, who opened the seminar, "was not convinced of this". "Past government policy for science, he said, has consisted mainly of transferring responsibility from one department to another, often without much effect". He further suggested "that only government is capable of carrying out a policy for science and technology", but that "policy should be formulated by scientists and opened up to public debate. This requires an increase in public awareness of science policy issues". "Formulating such a policy involves several difficult questions. Should science and technology have the first call on resources? Should a national policy for science and technology also include a consideration of the social consequences of science? Who is to devise and implement such a policy?" The discussion of these and related questions is briefly described.

195. "SRC Gives More Weight to Engineers", Nature, v. 224, no. 5216, 18 October 1969, pp. 211-212.

A reorganization of the University of Science and Technology Board of the Science Research Council (SRC) into two new boards, the Engineering Board and the Science Board, was announced in the annual report of the Science Research Council for 1968-69. "The Engineering Board is to look after the support of research and postgraduate training in the engineering fields as well as computing science and polymer science". The Science Board is responsible for support of pure and applied research and postgraduate training in biology, chemistry, enzyme chemistry and technology, mathematics and physics, and for the operation of certain cited facilities. In discussing SRC as a whole, the article notes that "[f]inancially, this has been another disappointing year with a little over half of the 9 per cent rise in gross expenditure over 1967-68 attributable to increased subscriptions to CERN, ESRO and the NATO scientific schemes, and much of the increases in any case due to devaluation. Gross expenditure is now £42.05 million, £3.48 million up on the previous financial year". In respect to policy, SRC intends to give priority to applied research and to concentrate "its support on a small number of groups in each field -- the 'centres of excellence' principle"; "to increase the priority given to postgraduate training and research which is directly concerned with the needs of industry, at the expense of other kinds of postgraduate work"; and "to ensure university staff increases no faster than in direct proportion to the student population".

USSR

196. "Science in the Urals", Nature, v. 224, no. 5215, 11 October 1969, p. 116.

"In accordance with the current plans for scientific development throughout the republics and regions of the Soviet Union work has now been started on the organization of a new science centre for the Urals. The first stage of the project, intended for completion in 1970, is the organization, on the basis of the existing Ural Branch of the Academy of Sciences of the USSR, of a science centre comprising institutes of mathematics and mechanics, physics of metals, economics, geophysics, geology and geochemistry, a number of chemical institutes and a section for the physico-technical problems of power production. Plans for future developments include an institute of technical cybernetics, a section on polymer physics and one on microbiology". "The announcement of the project specifically states that 'at the centre of attention' of the scientific workers of the new centre will be 'the problems of the development of the productive forces of the Urals and the complex use of the natural resources of this rich and abundant region'. But as well as this, there are plans for a programme of 'fundamental research in the field of the natural and general sciences' and for the training of scientific personnel. The centre will be based on a 'science village' of the now traditional type, and a site has been selected for this in a 'picturesque spot' close to the industrial city of Sverdlovsk".

Yugoslavia

197. Jamison, A., "Yugoslavia: Seeking to Link Science with Development", Science, v. 165, no. 3899, 19 September 1969, pp. 1241-1243.

The Yugoslav system of organization and management of science is described, and illustrated by reference to one of the country's largest research establishments, the Mihailo Pupin Institute for Automation and Telecommunications. The "system" is based on decentralization in which institutes are independent (except for a few institutes in nonlaboratory fields), self-managed ("whereby each worker has a voice in how the institute is run"), and operated on a "profit-making basis". "In fact, the decentralization extends even into the separate laboratories within the institute. Each has a small, elected council that is in charge of the setting of salaries and the financing of that laboratory". In addition to these institutes, which do R&D for industry (both foreign and domestic) and government, some 50 industrial labs have been formed as part of particular industrial enterprises. The government's role in the system, which "amounts to more than 25 percent of all the money" spent for R&D, is 'to stimulate institutes to find [industrial] partners, to interact with the economy wherever possible', and to support "macro-projects ... aimed at bringing several institutes together to conduct long-range studies in areas ... important to the society as a whole".